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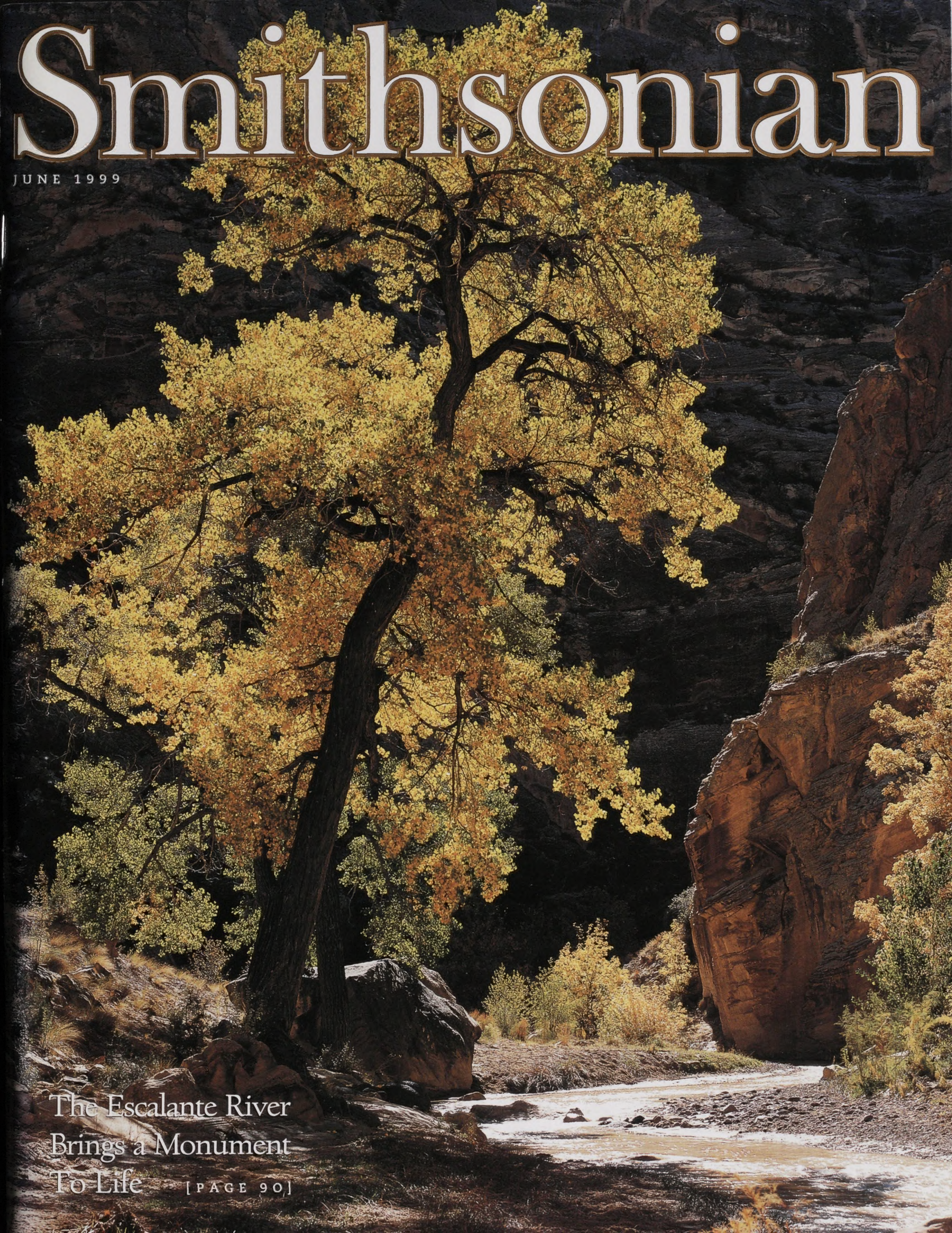

The Escalante River Brings a Monument To Life [PAGE 90]

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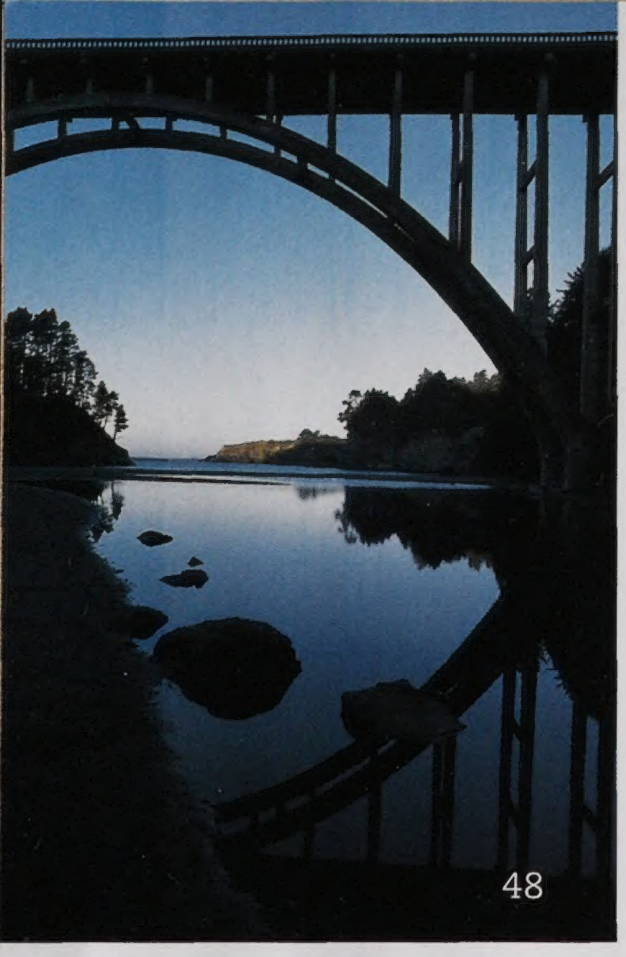
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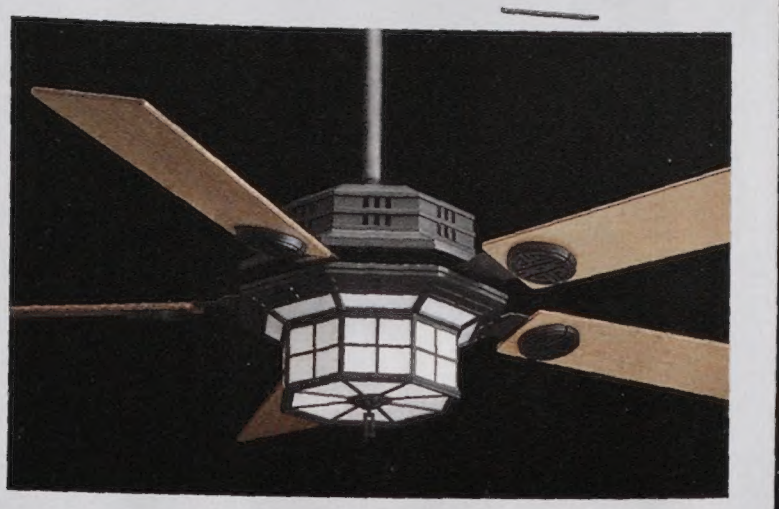

Stuart Westland
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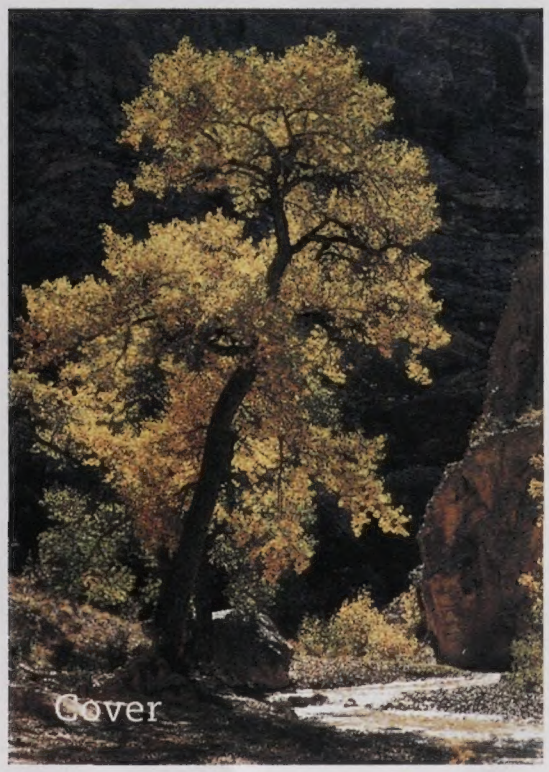

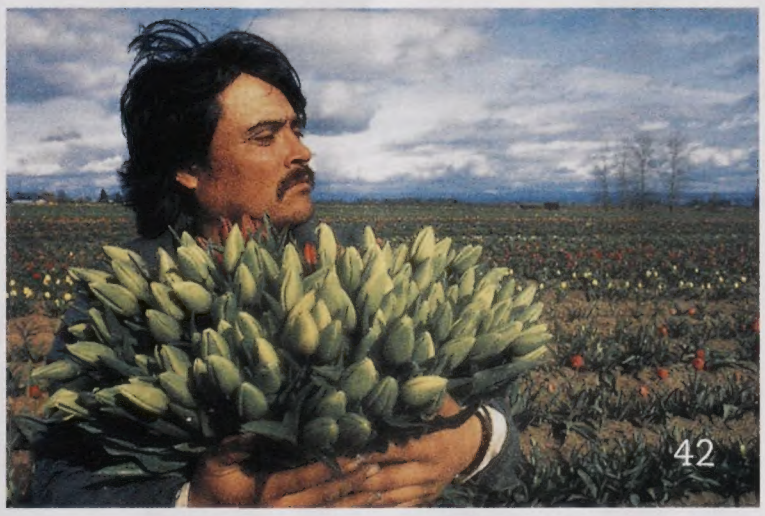

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Cover A cottonwood tree shimmers against Navajo sandstone cliffs on the Escalante River in southern Utah. The river flows through the Grand Staircase-Escalante National Monument, created by Presidential proclamation in 1996.
PHOTOGRAPH BY DAVID MUENCH

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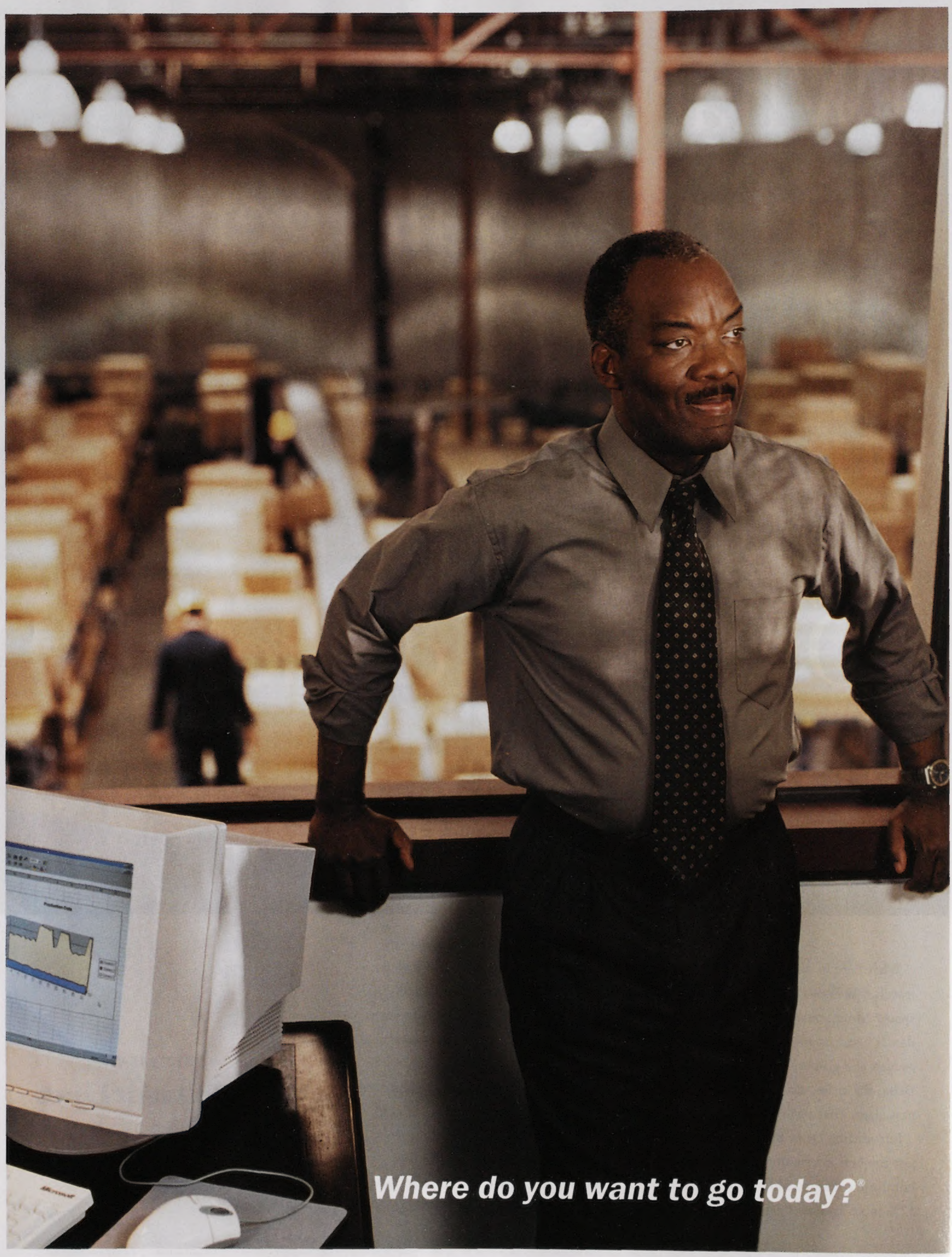
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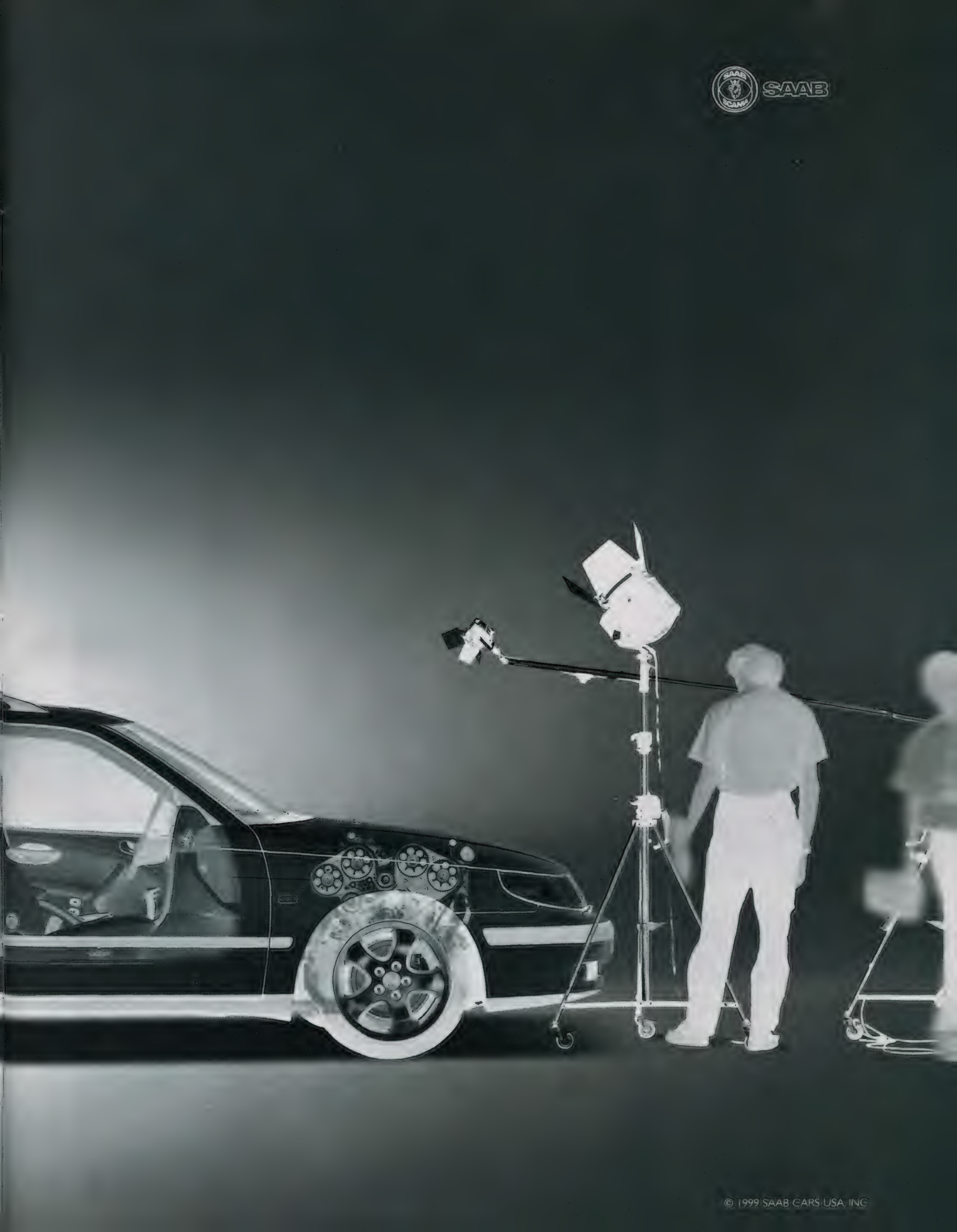

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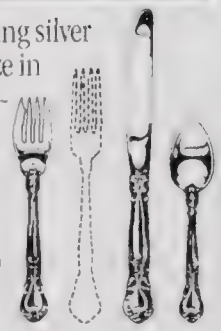

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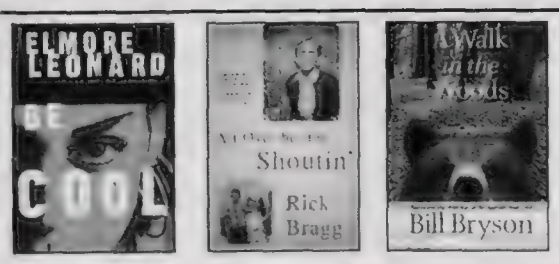

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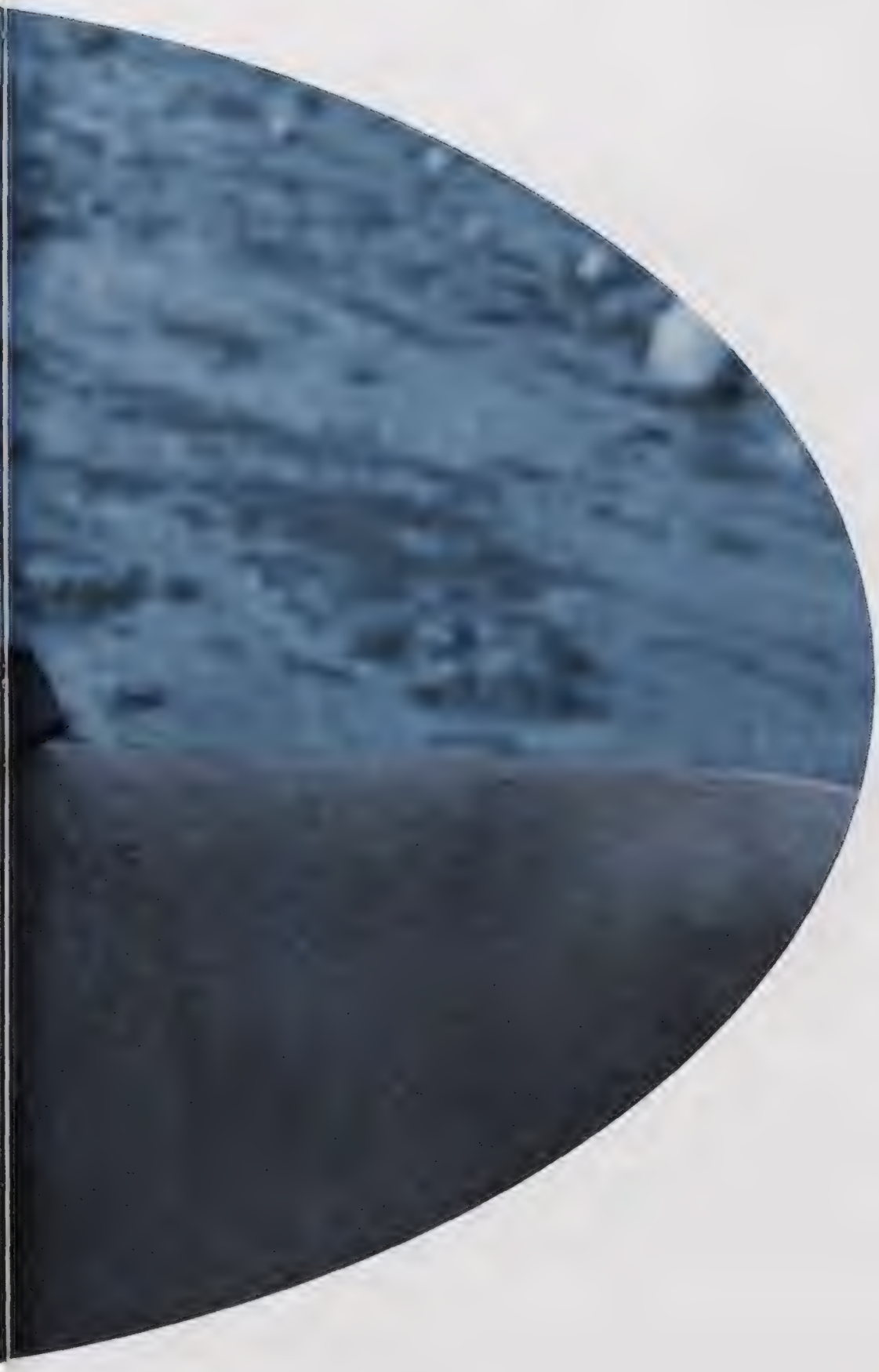

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PERSPECTIVES

In Praise of Modern Art

WITH A GROWING COLLECTION AND INNOVATIVE PROGRAMS, THE HIRSHHORN MUSEUM CELEBRATES ITS FIRST 25 YEARS

THE HIRSHHORN MUSEUM AND SCULPTURE GARDEN, the Smithsonian's museum for modern and contemporary art, will soon be 25 years old. Like the nearby Freer and Sackler galleries on the Mall, the museum is the result of a single individual's deep passion for art. Joseph H. Hirshhorn (1899-1981), a Latvian-born, self-made American financier, donated his much-coveted collection to the Smithsonian in 1966.

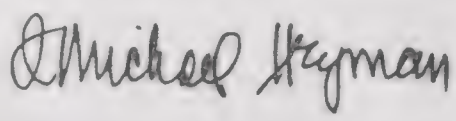
Congress had flirted with the idea of a national museum of modern art in the late 1930s, approving a plan to complement the National Gallery of Art's focus on old masters, but World War II intervened. Two decades later, Smithsonian Secretary S. Dillon Ripley, with the aid of President and Mrs. Lyndon B. Johnson, persuaded Hirshhorn to donate his collection to the nation. On October 1, 1974, the Smithsonian officially added a dynamic, ring-shaped building bearing the benefactor's name, and surrounded by nearly five landscaped acres, to its growing complex of museums on the Mall.

True to its genesis as a void-filler, the Hirshhorn's overarching mission has been "to encourage and develop a greater understanding and appreciation of modern art." Its annual attendance has always ranked high among American art museums (1998's visitor count was more than 850,000). Its exhibitions over the past quarter-century have been instructive, ranging from an exploration of foreign-born artists' contributions to American modernism to a trend-spotting survey of counter-modernist art. In response to glasnost, the Hirshhorn brought Americans long-hidden examples of revolution-era Russian and Soviet paintings. It presented important retrospectives for such established figures as Alberto Giacometti and Francis Bacon, while introducing the work of countless younger artists.

From the outset, Hirshhorn curators have carefully orchestrated the permanent collection to make the story of the art of our time clear and stimulating. In renovated galleries on three floors, the collection has also grown in scope over the years. One reason for this has been the steady stream of additional donations. In response to Hirshhorn's insistence that the museum be free, dynamic, fluid and open to changing tastes, the core holdings associated with his benefactions—including his numerous gifts of art after 1966 and his 1981 bequest of some 5,500 other works—have been expanded and updated through frequent acquisitions. For example, an early stringed figure by Henry Moore was acquired a few years back from the renowned British sculptor's family. To celebrate the acquisition, the museum mounted a small show telling the story of the work's creation and delineating its place in 20th-century art. Curators are constantly engaged in such research and interpretation for the public.

If the Hirshhorn offers the opportunity to "rediscover" established modern artists like Moore, it also serves as a kind of laboratory for contemporary visual expression. Because much of what the museum exhibits is contemporary, visitors are variously pleased, troubled, dazzled or perplexed by what they see. But the Hirshhorn tries to maintain an atmosphere that is exciting, nonthreatening—and never boring. Its docents train hard and lead stimulating, creative tours. Families make art a collective experience using the innovative *Family Guide*, a publication that encourages questions, responses, role-playing and other transgenerational interactions. In the popular "Young at Art" programs, children create their own artworks with their parents' participation. To offer fresh perspectives alongside the curatorial viewpoints, art students and artists are often invited to give gallery talks. There is a strong focus on outreach, with training for teachers to help them translate issues embodied by objects on view into useful material for classroom discussion. Culled from international festivals, films as art have also proven a successful component of the Hirshhorn's drive to foster understanding and appreciation of the art of our time.

Poised for its second quarter-century, the Hirshhorn seeks to expand its programs so that projects such as "Regarding Beauty: A View of the Late 20th Century," a 25th-anniversary survey that explores an age-old issue in art, can be presented and effectively interpreted well into the next millennium (the exhibition opens October 7). As a first step in establishing an endowment for this purpose, the Hirshhorn will present a gala fundraiser next fall. A passion for art is the only passport needed.



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BRUCE WATSON'S "CONCERTO FOR Pencilina and Sewer Flute," which appeared in the April issue, did not mention the master of experimental music: Spike Jones. During World War II and beyond, Spike Jones & His City Slickers, an orchestra made up of accomplished musicians, kept up our morale, playing such instruments as cowbells, whistles, pistols, pots, pans and garbage cans.

Spike (right) was known as the "King of Corn" and the "Man Who Murdered Music."

Jack Hawk
Santa Ana, California

JUST AFTER THE TURN OF THE CENtury, a musically inclined teenager named Bob Burns was practicing his cornet and trombone in the back of a plumbing shop in Van Buren, Arkansas. He slid a length of gas pipe inside a wider pipe, stuck a funnel on the end and played the contraption like a trombone. It sounded not much better than a wounded moose. Burns named his invention the "bazooka" ("bazoo" is a derivation of "kazoo"), and he became good enough to play it in Van Buren's Queen City Silver Cornet Band.

Bob "Bazooka" Burns joined the U.S. Marines during World War I and became leader of a jazz band that entertained the troops. Later he crisscrossed the country on the vaudeville circuit until its demise, playing his bazooka and telling jokes about fictitious friends and relatives in the Ozarks. During the 1930s and 1940s, he became a popular comedic radio star, appearing on the national radio

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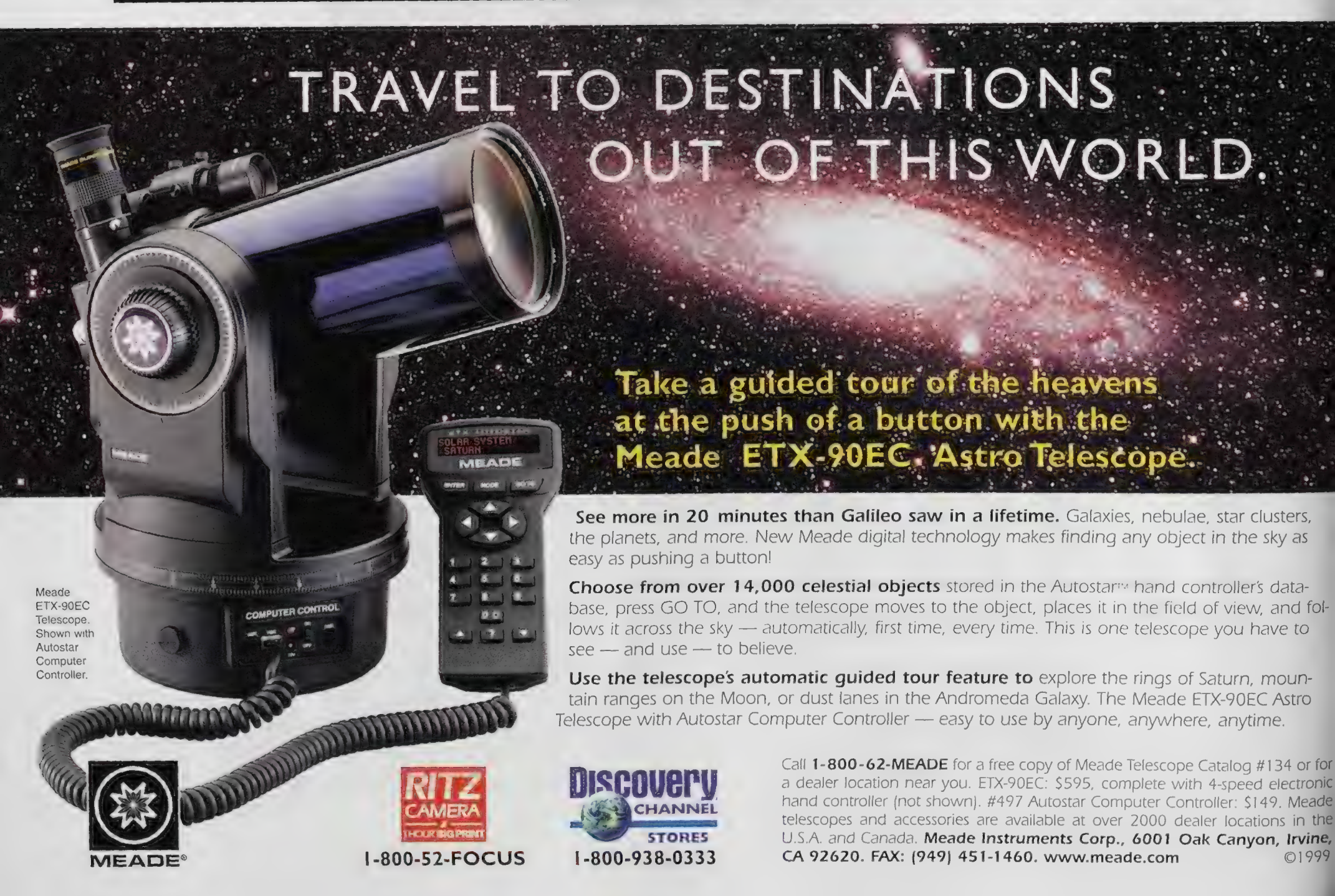
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shows of Paul Whiteman, Rudy Vallee and Bing Crosby. From 1941 to 1947, he starred in his own radio drama series, *The Arkansas Traveler.*

World War II combat soldiers thought the Army's new shoulder-held, antitank M9A1 rocket launcher looked like Burns' "wacky" instrument and nicknamed it the bazooka.

Billie Tisdale Woods
Fort Smith, Arkansas

THE TUNED BEER-BOTTLE ORGAN, OF which I possess a fine two-octave example, is most often employed in its more diminutive form (one octave) for the playing of holiday ensemble music, such as "Auld Lang Syne." One of the most attractive features of the tuned beer-bottle organ in its holiday guise is the necessity of preparing a fresh instrument for each performance. Unfortunately, tuned beer-bottle organ arrangements requiring complex chords can prove challenging because of the performers' inability to sound more than one note at a time and because those performers who were courteous enough to assist in the preparation of the instrument for tuning often have a tendency to giggle while playing. As any player of a wind instrument knows, laughter has a deleterious effect on one's embouchure. This may help explain why a tuned beer-bottle organ has not as yet received the scholarly acclaim that is most assuredly its due.

Elaine Wrenick
Cleveland Heights, Ohio

"ADOLPHE" SAX WAS BELGIAN, NOT German as your article stated. Antoine Joseph Sax was born in 1814, and lived in Dinant, which was part of France until 1831, when Belgium gained its independence. Interestingly, Dinant was for a long time a European center of copper and brass working (the French word for the trade is *dinanderie*). And since the saxophone is made of brass, it should not be a surprise that someone from Dinant came up with the idea for it.

Ted Fagerburg
Pepinster, Belgium

ABBOTT THAYER

REST ASSURED THAT THE THEORIES of protective coloration espoused by Abbott Thayer were made practicable and were the basis for camouflaging all U.S. Navy ships during World War II. Former portrait painter Dayton Brown, the Navy's camouflage officer, was well aware of Thayer's ideas. Brown's research confirmed that white was the best protection against a sea horizon, but the senior Navy

personnel were not wholly convinced. Consequently, all ships were painted light gray.

In 1952, I relieved Dayton Brown as the head of the Navy Visibility and Concealment Branch, BuShips.

Capt. Lewis B. Melson, U.S. Navy (Ret.)
Annapolis, Maryland

STEPHEN J. GOULD WROTE IN A 1991 article that artist Abbott Thayer had erred in attempting to force-fit the other two categories of animal adaptive coloration and patterns (advertisement and mimicry) into a unified concealment hypothesis. To support his claim that all coloration in animals worked primarily for concealment, Thayer invented improbable scenarios, the most flagrant example of these being that flocks of pink flamingos can mimic salmon-colored sunsets, allowing the birds to hide from both predators and prey. The position in which Thayer placed the bird in *Peacock in the Woods* was one that no peacock, living as its kind does in open fields, could ever hope or care to duplicate. It was these types of exaggerations and Thayer's flawed scientific methodology that motivated scientists to fiercely dispute his implausible and false simplifications.

John W. Jengo
Downingtown, Pennsylvania

LAWNS

READING DOUG STEWART'S ARTICLE on Americans' obsession with the lawn reminded me of the gentleman who sold me his house several years ago. After listening to me prattle about my plan for replacing the backyard concrete patio with a verdant, lush lawn, he sighed and said: "One thing you have to remember. You don't own a lawn; a lawn owns you."

Alas, I was young and failed to heed his guidance.

Lawrence Gamble
Santa Barbara, California

I DESIGNED GARDENS IN CALIFORNIA for more than 40 years, and I eventually learned to replace grassy lawns with flowers and other plants except where my clients needed a play surface. The reduction in expended energy, fertilizer and water soon paid my fee.

I now have a natural lawn in back of my house—just enough for games and picnics. The sides, the front and most of the back are wild gardens, full of spring flowers, butterflies and birds (and frogs, turtles, snakes, raccoons and at least one armadillo).

I do not pretend to know what it is that drives men to behave so abnormally and to devote so much time,

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his hair, his smile, his nose and even his name.

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Jere Stuart French
Gulf Breeze, Florida

BUD GUEST, THE SON OF POET EDGAR A. Guest, had a morning rush-hour radio program in Detroit back in the 1950s and 1960s, and each spring he'd describe how to rate your lawn's appearance. His "mph" (miles-per-hour) system rated a lawn by how it looked at various speeds. The ideal lawn looked great from a parked car, but a lawn that looked green and weed-free at 5 to 10 miles per hour also scored high. A yard that looked good only at 25 mph or higher, however, was a definite flunker. Today, at 79 and retired, I am happy to manage an occasional 15-to-20-mph rating.

Paul Stewart
Terre Haute, Indiana

PROPHETS

IRRESPECTIVE OF THEIR DEGREE OF truth, predictions of the future are not without value. Humans flounder in hesitancy and indecision. Success in any venture depends less on knowing what to do than in doing it with supreme confidence. A deeply trusted psychic can fuel the needed self-confidence to make even the shakiest underpinnings bear one up on the road to success. Makes me wish I were a believer.

James S. Wood
Salem, Oregon

BARBARA HOLLAND'S REFERENCE TO our own Nostradamus, Jeane Dixon, touched a nerve. Fresh back from Vietnam in 1969, I was assigned to escort Ms. Dixon on a tour of an Army hospital in Georgia. The tour was pleasant, and at the end, just before she stepped into her limo, she looked me in the eye, shook my hand and said, "Lieutenant Futch, so nice to have known you."

I spent the next three weeks hiding under my bed.

John Futch
Long Beach, California

WRITE TO SMITHSONIAN

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Putting the Brakes on Light

LIGHT TRAVELS 186,000 MILES PER SECOND IN A VACUUM; IN LENE HAU'S LAB, IT AMBLES AT 38 MILES AN HOUR

JOHN P. WILEY, JR.

SO I'M READIN' THE PAPER AND see where this Danish woman has slowed light down to 38 miles per hour. It takes a bit for that to sink in. But yes, that's per hour, and that is 38 miles. Right there in print. Now we have all known all our lives that in a vacuum light travels 186,000 miles per *second* and not all that much slower—for our purposes—when it is moving through air, say, or water. Light from the sun takes only eight minutes to reach us, some 93,000,000 miles away. If light dawdled along at 38 miles per hour, it would take approximately 275 years for a photon to move from the sun to the earth. Horses can run faster than 38 miles per hour, for goodness' sake. If you'll allow a little poetic license about light sources and whatnot, this woman has figured out how to catch a sunbeam.

A teacher at Harvard University, Lene Vestergaard Hau also works at the Rowland Institute for Science, a research center founded by the inventor of Polaroid photography, Edwin H. Land. She took one of the most esoteric technological accomplishments of recent times and, if you'll pardon the pun, shed new light on its usefulness. Hau works with matter in a state so nonintuitive it can only be called weird. When you cool the right stuff down to a temperature of a few hundred billionths of a degree above absolute zero, strange things happen. The motion that animates every atom (in the macro world, we feel that motion as heat) nearly stops. According to the Heisenberg uncertainty principle, once we begin to know the momentum of an atom very accurately (extremely close to zero in this case) we cannot know where it is. This is the world of quantum mechanics, where classic physics no longer applies. The space in which each atom can be found spreads out farther and farther, overlapping with all the others. The atoms lose their identities, flowing instead into an amorphous cloud known as a Bose-Einstein condensate. (It is named for Satyendra Nath Bose, an Indian physicist, and Albert Einstein, who predicted the condensate's existence a full 70 years before technology could get us even close to the necessary temperatures.)

Resting on an optical bench are some of the lenses, mirrors and beam splitters Lene Vestergaard Hau uses to steer laser beams through sodium atoms cooled to almost absolute zero.

The condensate is fascinating in its own right. The atoms, now one big atom, act in unison. They are analogous to the photons in a laser, all lined up the same way, producing what physicists call a coherent beam of light. On the quantum mechanical level, atoms have dual personalities, just like photons of light. For some purposes, it works best to think of them as particles, as we lay folk normally do. For others, however, it works better to consider them as waves. In the condensate, the waves of each atom have coalesced into one big wave. This wave can be so big, in fact, that it can be seen by the human eye.

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Hau aimed a laser beam through just such a cloud of nearly motionless sodium atoms. (The cloud was just 1/125 inch long.) This first beam, known as the coupling beam, induces quantum changes in the atoms such that the cloud becomes transparent, but with an extremely rapid change in the refractive index. Refraction is what happens to light as it passes from one medium (such as air) into another (glass, for example). We've all seen that a pole partly in water appears to be bent at the surface, even though we know it isn't. We see refraction at work every time we watch a clear sunset. The sun appears to be still above the horizon when in fact it has already set, because the earth's atmosphere refracts the light coming from it. In Hau's laboratory, the nonlinear refractive index of the sodium cloud is about a hundred trillion times higher than that of glass in optical fiber. The cloud will now do to light what molasses up to her shoulders would do to a runner.

A second laser beam, the probe pulse, goes through this transparent-but-oh-so-refractive cloud at a right angle to the first. It is the light in this beam that is slowed to a crawl. Hau is not resting on her laurels. She hopes to use her apparatus to reduce the speed of light even further, to as little as 120 feet per hour.

One of the legends of the pre-Jackie Robinson Negro Leagues was James "Cool Papa" Bell, so fast that he often stole two bases on one pitch. The equally legendary pitcher Satchel Paige said that Bell was so quick he could turn off the light and "be in bed before the room was dark." With the help of Hau, I could do it myself, even though normally it would be the miracle of the ages.

As it happens, I have no immediate plans for using light traveling at 38 miles per hour. The idea that someone has been able to slow down light to such an extent, however, has knocked down a whole wall in my mind. The speed of light is one of the most fundamental numbers we know: to the best of our knowledge, nothing that is at rest or traveling at any speed less than that of light can ever be made to move at the speed of light, much less faster. Not only does the mass of the object approaching the speed of light increase toward infinity, the object becomes shorter and shorter in the direction of travel until it loses the dimension of length. And yes, as far as our unidentified object is concerned, time stops. Now light does travel more slowly in air than it does in a vacuum, and still slower in water, a mere 139,500 miles a second. But not one of my aging neurons thought for a minute that light could be slowed to the approximate velocity of a galloping horse or, if Hau reaches her goal, a snail.

Before everyone falls out of their chairs laughing, let's wait to see what the scientists come up with to explain the antigravity force.

Crazy images flicker through my head. Suppose we learn to slow sound at will. And suppose someday, somewhere, I blurt out something stupid. I could jump out of my chair and step in front of my words as they mosey across the room, and say: "Ignore what you're about to hear. It's all a mistake." And because I am closer to the hearer, that person hears my "Ignore" before hearing the original gaffe, even though I uttered the gaffe first. It's almost, almost, a tiny, trivial bit of time reversal.

Let's go for broke here. Death and taxes have nothing on gravity. It is with us all the time and everywhere. (As I age, gravity seems to be pulling me into the ground with increasing vigor. It can't be true, can it?) Physicists speak of the gravitational constant. If you must know, the gravitational constant, known as Big G, is 6.67×10^{-8} $cm^3/g\ sec^2$. Little g is the strength of gravity at the earth's surface. Now hush. The point is that it's constant, at least until now. Today we have new ways of measuring the longest distances in the universe, using exploding stars as our ruler ticks. We are finding that instead of being slowed by the aggregate gravitational pull of all the galaxies, stars and dark matter behind them, the galaxies farthest away appear to be accelerating away from us.

Well, my fantasy is obvious. Phenomena that we believe exist only at astronomical scales can surprise us. Black holes objectify "big" and "strong." The small ones are the remains of massive stars that collapsed in on themselves. The big ones are the equivalent of millions of stars, sitting at the centers of galaxies like so many insatiable spiders. And yet Stephen (*A Brief History of Time*) Hawking once imagined black holes so small that were they floating by us in the park, even residing inside our homes, they might go undetected. So suppose antigravity can also exist on a small, let's say human, scale. How strong might it be? Oh, just enough for you or me to float up into the sky at will. Before everyone falls out of their chairs laughing, let's wait to see what the scientists come up with to explain the large-scale antigravity force. Let's see if they can duplicate the force in a laboratory, making little shuffleboard pucks on a tabletop rebound from each other in the same way that the north poles of two magnets brought together will repel each other. And let's all remember that electricity was once no more than a laboratory curiosity.

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AROUND THE MALL & BEYOND

Renovating Washington's Monument, Designer-style

BY MICHAEL KERNAN

FOR THE FIRST TIME SINCE 1934, the Washington Monument, just west of the Smithsonian Castle on the Mall, is covered with scaffolding, as it undergoes a $9.4 million renovation. Encased in a blue mesh overcoat that surrounds it from base to tip, it looks as though it has put on weight.

A big tent out by 15th Street houses a temporary interpretive center, itself costing $2 million.

There I find a mock-up of the observation room that sits at the very top of the obelisk. Computers give a virtual view in all four directions of what visitors would be seeing were the scaffolding not obstructing their view. Then, in reality, we are sent in pulses of about 25 people each to the shaft itself, passing through a magnetometer on the way.

"The walls are 15 feet thick at the bottom and 18 inches thick at the 500-foot level," our guide tells us as we ride up in the elevator. "When the monument was completed in 1884, it was the world's largest building, and it's still the largest freestanding stone structure. The scaffolding is freestanding, too: 37 miles of aluminum wrapped around the shaft."

The foundation is 36 feet 10 inches deep—unless there exists, as pop artist Claes Oldenburg depicted in a famous conceptual drawing, a giant pair of scissor handles underground. The structure does look rather like closed scissor blades.

The blue screen netting over the scaffolding is mostly decorative. It is designed to mimic the stone block pattern and preserve the general shape of the beloved national icon. Its creation was the idea of the distinguished restoration architect and designer Michael Graves.

"It's important for all Americans to understand the life cycles of our buildings," Graves has said. "If one thinks about the number of instances in places such as Rome or Florence where buildings are covered in scaffolding, one understands that in those cultures with buildings of greater age than ours, this is not an unusual occurrence." There definitely are scaffoldings and scaffoldings. Some are just a bunch of dangerous-looking boards set on a framework of pipes and all of it spattered with paint and plaster dust.

This one is a thing of beauty. It gives the monument a new solidity, although it loses that wonderful slim, spearlike effect of the structure itself. Graves is famous for his architectural light touch: he has designed everything from whistling teakettles on up. The reaction to the scaffolding has been mixed: some say it makes the shaft appear klutzy; others say the monument looks more interesting than ever. In any case, we all yearn for the day in the late spring of 2000 when it is unveiled.

What precisely is being done? Stephen Lorenzetti of the National Park Service explains that the entire exterior will be cleaned, all the joints repointed and the lightning protection system repaired.

I didn't know this but I should

During repairs, the monument's scaffolding is prettied up by patterned mesh fabric.

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have guessed: the structure gets struck by lightning about once a year. Thus, there are lightning rods in the pyramidion, even in its pencil-sharp point. These rods are made of copper, and are platinum-tipped and gold-plated. The platinum protects the copper from melting, and the gold keeps the copper from patinating—that is to say, staining—the stone.

The eight windows at the top will be reglazed and the red aircraft warning lights recaulked. But mostly the work will involve the marble blocks.

Derricks about the shaft in 1878 denote resumption of work after a 23-year halt.

"We'll seal the cracks and patch the stones where needed," Lorenzetti tells me, "and put in dutchmen where they are needed."

All right, what is a dutchman?

"That's where most of the stone is still good, but it's so damaged that a patch wouldn't hold, so we cut out part of the stone and replace it with a similar piece, pinning it into the stone. Marble doesn't take pressure that well. Pressure builds on the corners and they break off."

Already, especially on the bottom 40 feet of the shaft, there are a lot of dutchmen in place.

"To get the dutchmen," Lorenzetti says, "we went back to the original quarry sites, and though the first is still operating, it grinds stone for industrial uses, not for marble blocks. The second one is now a swimming club. We had a topographic map and we pulled in on a hot June day to look for stones, and they didn't have a clue what we were doing. But they were very helpful: they had some stones left around and donated them to the Park Service."

Then there is the matter of old stains, some from the dirt in the air, some from copper gutters that were installed over the windows at one time. Even when the gutters were finally removed, the hardware that held them to the building was left and stained the stone even more. That will be corrected.

There are some 36,000 stones in the monument. The mortar between them has been replaced at least twice. Some were caulked—"that was popular in the '60s and '70s, but we're getting away from that," explains Lorenzetti. Caulking uses a rubbery substance, but the experts now prefer a very soft mortar mix, "so it won't be as strong as the stone and if anything moves, it won't be the stone that gives."

Inside, the 193 memorial stones—presented by cities, states, countries, groups and individuals—and two descriptive stones will be cleaned and restored, though not to mint condition, as that would be a sin against the venerable age of the shaft.

The restoration began in January 1998 when the monument was closed so that heating and air-conditioning systems could be upgraded. The elevator, which dates from 1959, also was modernized. That project alone cost $1.9 million. The exterior work is billed at $6 million.

As the work proceeds, there will be from 15 to 20 workers on the scaffolding at any one time. Five platforms are stationed at intervals up the shaft, and there is safety netting "to catch any errant tools, stones—or workmen," Lorenzetti says.

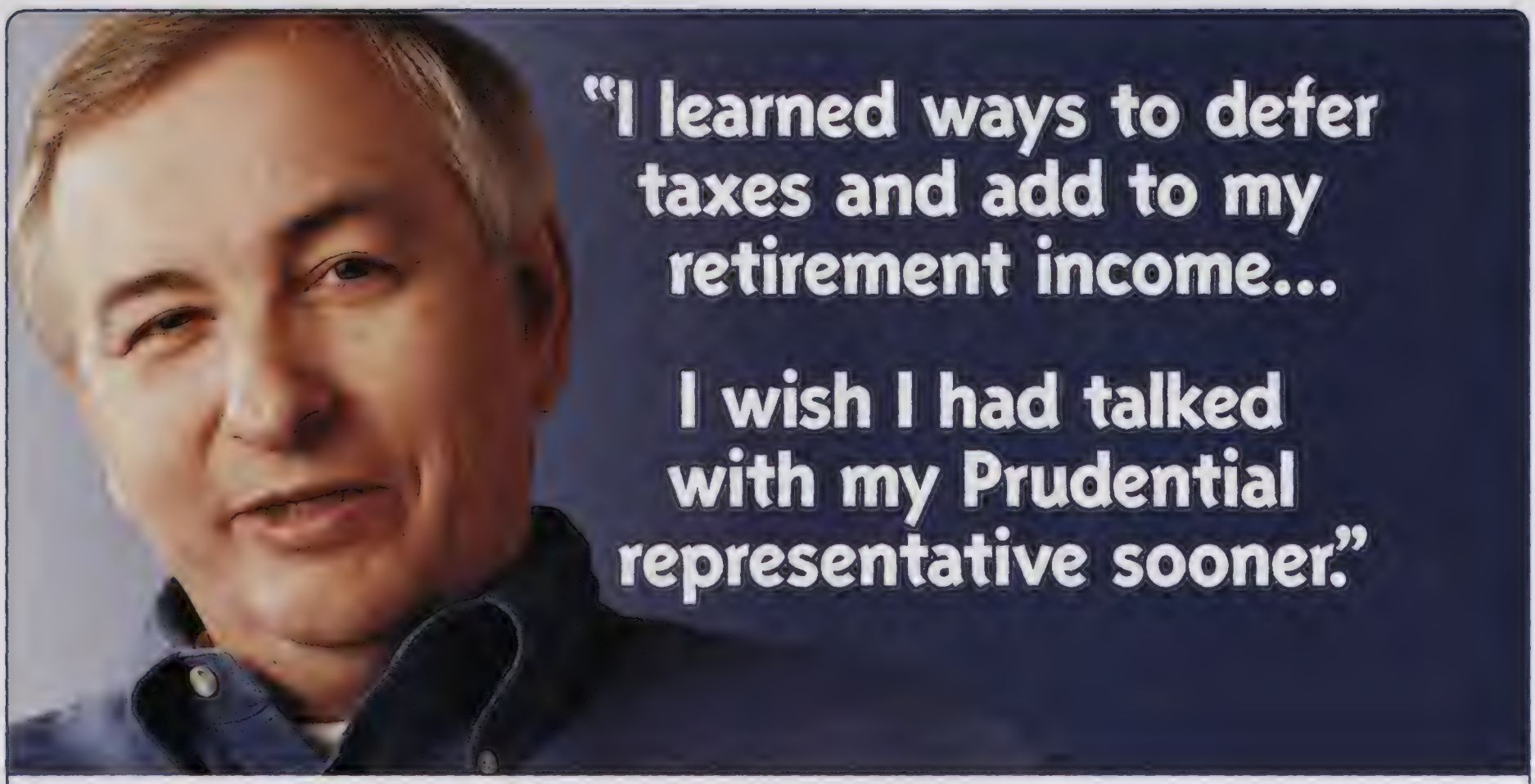
By the way, it is lit up at night with hundreds of fixtures donated by General Electric, one of several corporate partners in the project. Target Stores persuaded other corporations to join them, and together they have raised more than $5 million for the rehab job; Congress provided $1 million. Target added another $1.5 million for interior renovations to the observation room and exhibit areas, and to the elevator cab.

The monument envisioned in L'Enfant's 1791 plan for Washington was to have had a sort of Greek temple at the base, but Lt. Col. Thomas L. Casey of the Army Corps of Engineers, who directed part of the construction, disposed of that idea. He modeled the monument on the obelisks that the Romans had brought from Egypt to Rome as booty. The classic proportions were ten feet in height for every foot in width at the base, with the peak cut away at a 60-degree angle. This 550-foot obelisk measures 55 feet 1.5 inches wide at the base, 34 feet 5.5 inches at the top.

The monument was constructed in two phases, as funds allowed, from 1848 to 1855 and 1878 to 1884, and cost $1,187,710 to build.

Its moment of glory as the world's tallest structure was short. In 1889 the Eiffel Tower shot up 984 feet, celebrating the new technology of metal and achieving an effect of lightness that no stone monument could match.

In the past 50 years the Washington Monument has settled two inches. (It weighs 80,000 tons.) In a 30-mile-per-hour wind it sways one-eighth of an inch. That sounds like a pretty solid piece of work. Maybe Claes Oldenburg was right—maybe there are giant handles underneath.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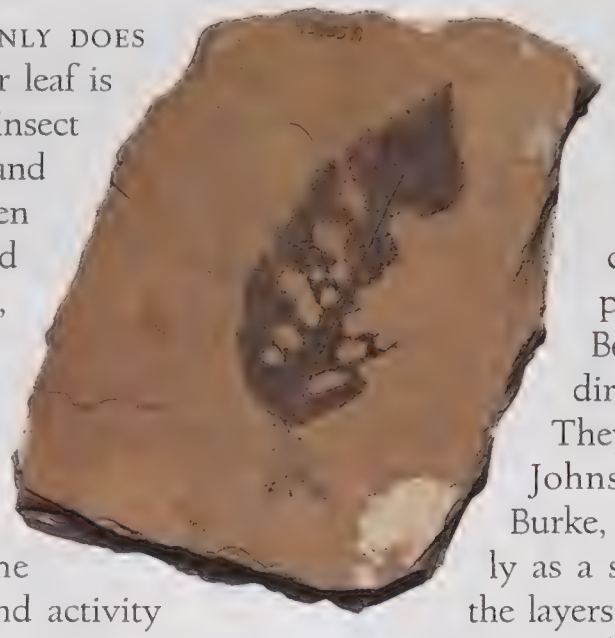
THE OBJECT AT HAND

Stories in Stone Read From Ancient Leaves

A SMITHSONIAN SCIENTIST STUDIES THE RELATIONSHIP BETWEEN EOCENE INSECTS AND THE PLANTS THEY ATE

BY WILLIAM CANNON



AS LEAVES GO, THIS ONE CERTAINLY DOES not look like a keeper. The alder leaf is full of holes caused by a marauding insect and is not the sort you would collect and press between the pages of a book, even if it weren't stone—a 48-million-year-old fossil. But it is precisely the ugly, insect-munched holes in the object at hand that fascinate Conrad Labandeira, of the Smithsonian's National Museum of Natural History. Labandeira is curator of fossil arthropods, which include fossil insects, and he studies insect variety, distribution and activity going back millions of years in the fossil record. Labandeira's brand of science often requires him to collect not only the good specimens, but the bad and, in the case of insect damage, the ugly. In fact, sometimes they're the best.

One of the key places to go to collect insect-nibbled samples of the fossil record is the small town of Republic, east of the Cascade Mountains in Washington State. "All major types of herbivory appear to be present at Republic," says Labandeira, speaking broadly of plant eating. "The fossils go about as far back as we can go in the fossil record and still record insect damage on the standard, or closely related, genera of plants that occur today."

Republic dates back to the Eocene, the epoch when the earliest relatives of many of today's familiar plants took root. What's more, Republic was a crossroads between highlands and lowlands, warm climate and cool, north and south. Plants thrived together there that have not been found together anywhere else. It was also where many modern plant lineages that attract predatory insects made their earliest appearances, placing the Republic flora among the oldest in which modern plant-insect associations can be traced in the fossil record.

That is why, one recent fall, Labandeira and Kirk Johnson, curator of paleontology at the Denver Museum of Natural History, headed out to Republic, joined by Wesley Wehr, affiliate curator of paleobotany at the Burke Museum of Natural History and Culture in Seattle. Together they collected samples from the more than 300 types of leaves, cones, fruits, seeds, flowers and insects to be found there.

Tlick-tlick-tlick, tlick-tlick-tlick. Beneath a candy-striped canopy, more than a dozen people with hammers and chisels work Boot Hill, an unassuming pile of rock and dirt that lies at the north end of Republic. They are "Leaf Whackers," volunteers from Johnson's museum. With others from the Burke, they split open slabs of outcrop as quickly as a shale-prying colleague can deliver them, the layers dried and loosened with a weed burner that looks like a flamethrower. This is the first large-scale, systematic dig at Republic.

Johnson's eyes are locked on a just-delivered rock. "Look at the beautiful angiosperms. That's the fun stuff, this forest coming up out of the ground, hearing the oohs and aahs." He passes the fossil to two Leaf Whackers at a nearby picnic table, who catalogue it on the spot for the Denver Museum's collection. Johnson describes this as the "blitzkrieg method—we bore into the hill, and we get years of data in one week. Bit by bit the various fossils check

Smithsonian paleobiologist Conrad Labandeira splits shale to find fossils such as this alder leaf (top), likely eaten by a leaf beetle.

D.E. HURIBERT, SI; ROBERT BURKE

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Volcanoes erupted, raining ash on the lake, burying and preserving leaves in its mud.

in. To get this many samples would take one person two years." By the time the five-day dig is up, they will have chipped out and logged more than 1,500 fossils, far more than the minimum number of samples required for an unbiased reconstruction of the Republic flora, the plants represented pretty much in the proportions in which they lived.

Over the past two decades, Wehr has brought legions of other paleontologists to Republic—and taken pieces of Republic to them. Among the more than 3,000 Republic specimens Wehr and his assistants have gathered for museum collections are the first known occurrences of fir, apple, blackberry, holly, horse chestnut and other plants with living relatives.

At the Boot Hill site in Republic, Washington, volunteers from Denver and Seattle museums comb the hillside for fossil leaves bearing evidence of insect damage.

None of this interest in Republic would have been piqued had not Wehr and Johnson come over the mountains from Seattle in 1977, when Johnson was only 17, to see what they could find. The route they followed from Seattle is an imitation of how geological events literally made Republic what it was. Like many visitors, they came to the town by way of the North Cascades Highway. East of the mountains, the first town Johnson and Wehr hit was Winthrop. One hundred million years ago, Winthrop would have been on the east coast of a big island, the North Cascades subcontinent, which was banging into North America. The land Wehr and Johnson were headed for, the Okanogan subcontinent, where Republic roosts today, had already merged into North America.

As the North Cascades and Okanogan subcontinents collided, what was left of the ocean floor between them was pinched against and beneath the Okanogan. The pressure caused the Okanogan to bulge, raising the elevation perhaps as high as 4,500 feet above sea level.

Volcanoes form when continents collide. Some of them near Republic erupted, raining ash on the lake, burying and preserving leaves and anything else around in its mud. The ash stamped a date on the lake bed, placing it in the mid-Eocene, about 48 million years ago, a time in earth's history when the greenhouse-gas carbon dioxide was high. There were no land masses to block an equatorial ocean current that warmed the planet. There was no polar ice, and life flourished—all over. Alligators and turtles swam in streams flowing into the Arctic Ocean, and temperate forests stretched above the Arctic Circle and across the Northern Hemisphere.

Plants that did well at higher elevations—pine, spruce, hemlock, golden larch, cedar and other conifers—thrived at Republic beside maple, sycamore and other broadleaf trees that stretched across the Northern Hemisphere. Add to the understory more than 30 members of the rose family, clematis, hydrangea, grape and other plants, and the panorama begins to get crowded.

Wehr and Johnson didn't expect to find much there. Republic was little more than a footnote in the annals of Washington geology; only a dozen or so specimens worth mentioning had been found early in the century. "I hit a rock with my foot," Johnson says, "and boom, *Metasequoia*"—dawn redwood.

Republic today is special in another way: the Boot Hill site is open to the fossil-hunting public. This is particularly unusual in an age in which most ancient natural treasures are protected. From May through October, anybody who ventures here may get a permit and rent a gunnysack with a hammer and chisel from the Stonerose Interpretative Center, a museum and gift shop a few blocks from Boot Hill. Like trout fishermen, fossil hunters here have a limit of three keepers a day.

This outcrop greeted more than 8,000 visitors in 1997, one of the Stonerose Center's busiest years since it opened in 1987. The locals are proud of Republic's reputation as a garden of stone. Local companies lend earthmoving and other equipment to visiting scientists. The *Republic News-Miner* carries front-page stories about Stonerose events.

At the site, Stonerose curator Lisa Barksdale checks fossil-hunters' finds to ensure that something new and of scientific value doesn't shuffle off to Buffalo. Usually, peo-

ROBERT BURKE

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A gold-rush mentality sets in. "Once a lady screamed at me, 'You confiscated my fossil!'"

ple are happy to turn over an old leaf. Once, the National Museum of Natural History put out an urgent call for an Eocene beech leaf—it needed one for an exhibit. The next day, two boys rented hammers and returned to the interpretive center with one in hand. They were thrilled that their rock was going to the Smithsonian.

Sometimes, though, it can get ugly. A gold-rush mentality sets in, Barksdale says. "Once a lady screamed at me, 'You confiscated my fossil!'"

The Republic dig was just the beginning for Conrad Labandeira. After Johnson definitively IDed the week's haul, the fossils, along with Republic fossils from other digs, were shipped to Labandeira's lab at the Smithsonian to be photographed so that insect leaf-damage could be computerized and measured. Labandeira's pre-analysis educated guess: that the fossils' insect damage would claim between 3 and 5 percent of the plant material, toward the high end of what he's seen in the fossil record. (It actually turns out to be only 3 percent, not counting conifers, which tend to be bug resistant.) Should you be keeping score at home, the insects are winning. Today they claim 7.5 to 12 percent of our foliage.

Along with tallying the damage, Labandeira says, "there's a qualitative element, too—a question of who's doing what to whom." Paleoentomologists associate different damage with a variety of strategies that may change as plants and insects coevolve. Based on what the Leaf Whackers have collected so far, and on Labandeira's inspection of the Burke and Stonerose collections, which are also part of his study, "much of the damage is host-specific."

Some damage is obvious and familiar to anybody who has ever looked casually at leaves and noticed that some look like they have had holes punched in them, or has seen a tree denuded of its foliage by caterpillars. This is external feeding, "by far the most abundant feeding strategy in the fossil record," says Labandeira.

Then, in keeping with Republic's gold-rush past, there are the internal feeders, or leaf-miners. As fly, beetle, moth and other tiny larvae eat their way through a leaf's innards, they leave typical patterns that look like minuscule mole paths. Some species like to chew along the middle vein of a leaf; others will meander along the margin and leave serpentine trails.

Damage also can be quite literally galling. A gall is a tumorlike nodule made by the plant in response to infestation. A culprit at Republic appears to be the gall midge. "It's an arms race," Labandeira says. "Plants make noxious compounds that increase in intensity; the insect might be slowed down, but it adapts. In the case of the gall, the plant is co-opted—it secretes compounds that promote anomalous tissue growth. The insect lives in the gall and lays its eggs right in the plant tissue.

"The salient Republic issues are: Can any of this damage be matched taxonomically with damage on living relatives of the Eocene plant hosts? If so, what is the biological meaning of coevolutionary stasis for 48 million years? Are there good examples of host-shifts? If so, are the modern hosts taxonomically or otherwise chemically similar to the Republic Eocene hosts? How does any of the data support or refute any of the theories regarding how insects and plants coevolve in time?"

Labandeira worries that paleobiologists may not be sampling much of the Eocene herbaceous vegetation. Herbaceous vegetation is at the receiving end of much of the herbivory in modern communities. "What's more, we have only several data points from the fossil record from different vegetational settings; most likely we are not seeing anything of a robust signal in terms of the overall Phanerozoic trend dating back 310 million years."

This is Labandeira's way of saying he can't tell from Republic specimens whether insects are consuming more leafy matter now than they did 48 million years ago. Perhaps they are, but the available evidence could also mean that an unknown portion of the insect-damaged leaves that could decide the question one way or the other simply was not fossilized. What we do know for certain is Eocene insects at Republic were choosing the plants they consumed, and that the variety of damage qualitatively matches that of today. Republic seems to have been a modern but less intense world.

In the end, Labandeira and his fellow geological time travelers are like leaf beetles attempting to chew off more of the fossil record. Every once in a while, they connect with a Republic and, with a few more precious bug-damaged leaf assemblages, come a little closer to figuring out how the world we know got to be this way.

A canopy over the dig site protects two Leaf Whackers as they confer about the identification of a fossil.

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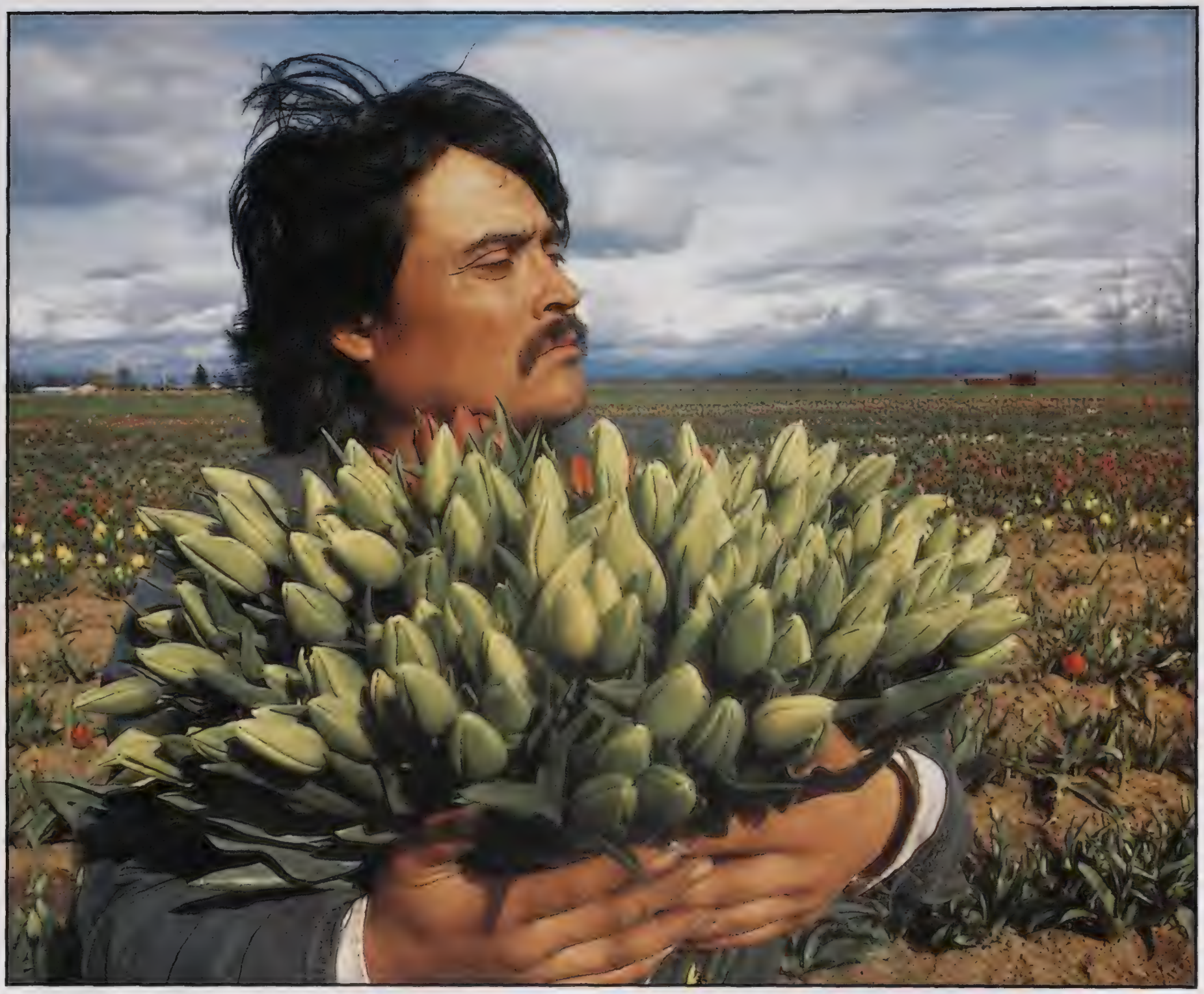

"Americanos: Latino Life"

SMITHSONIAN HIGHLIGHTS

LATINOS PROUD OF THEIR HERITAGE AND of being Americans are the focus of a five-year multimedia program, "Americanos: Latino Life in the United States." The centerpiece is a traveling exhibition of 120 photographs by 30 prizewinning photographers, grouped by six themes: work, family, spiritual life, community, sports, and culture and the arts. Photographer Timothy Gonzalez is part Mexican, part Irish. Above is his picture of migrant worker Luis Estrada, holding tulips that he has just picked from a field in Oregon. The work is tedious and very tiring, and migrants often talk about how painfully they miss the warmth and color of Mexican culture. Also exhibited are portraits of astronauts Franklin R. Chang-Díaz and Ellen Ochoa, activist César Chávez, designer Yoo-mi Lee, home-run star Sammy Sosa, fashion designer Oscar de la Renta, actress Rita Moreno and singer Gloria Estefan. "Americanos" was organized by the Smithsonian Traveling Exhibition Service (the world's largest such service) and the Smithsonian Center for Latino Initiatives. It premiered at the National Museum of American History this spring and will begin a national tour this fall. To see more pictures, and for links to Websites with schedules and information about other "Americanos" productions—a book of the photographs with essays and poems, a documentary film to be aired this fall, and a music CD—visit www.smithsonianmag.si.edu. *—Bruce Hathaway*

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CONTRAINDICATIONS: Transderm Scōp is specifically contraindicated in persons who are hypersensitive to the drug scopolamine or to other belladonna alkaloids, or to any ingredient or component in the formulation or delivery system, or in patients with angle-closure (narrow angle) glaucoma.

WARNINGS: Transderm Scōp should not be used in children and should be used with special caution in the elderly. See PRECAUTIONS.

Since drowsiness, disorientation, and confusion may occur with the use of scopolamine, patients should be warned of the possibility and cautioned against engaging in activities that require mental alertness, such as driving a motor vehicle or operating dangerous machinery.

Potentially alarming idiosyncratic reactions may occur with ordinary therapeutic doses of scopolamine.

PRECAUTIONS

General: Scopolamine should be used with caution in patients with pyloric obstruction, or urinary bladder neck obstruction. Caution should be exercised when administering an antiemetic or antimuscarinic drug to patients suspected of having intestinal obstruction.

Transderm Scōp should be used with special caution in the elderly or in individuals with impaired metabolic, liver, or kidney functions, because of the increased likelihood of CNS effects.

Caution should be exercised in patients with a history of seizure or psychosis, since scopolamine can potentially aggravate both disorders.

Information for Patients: Since scopolamine can cause temporary dilation of the pupils and blurred vision if it comes in contact with the eyes, patients should be strongly advised to wash their hands thoroughly with soap and water immediately after handling the patch. In addition, it is important that used patches be disposed of properly to avoid contact with children or pets.

Patients should be advised to remove the patch immediately and contact a physician in the unlikely event that they experience symptoms of acute narrow-angle glaucoma (pain in and reddening of the eyes accompanied by dilated pupils). Patients should also be instructed to remove the patch if they develop any difficulties in urinating.

Patients should be warned against driving a motor vehicle or operating dangerous machinery while wearing the patch. Patients who engage in these activities should also be aware of the possibility of withdrawal symptoms when the patch is removed. Patients who expect to participate in underwater sports should be cautioned regarding the potentially disorienting effects of scopolamine. A patient brochure is available.

Drug Interactions: Scopolamine should be used with care in patients taking drugs, including alcohol, capable of causing CNS effects. Special attention should be given to drugs having anticholinergic properties, e.g., belladonna alkaloids, antihistamines (including meclizine), and antidepressants.

Carcinogenesis, Mutagenesis, Impairment of Fertility: *No long-term studies in animals have been performed to evaluate carcinogenic potential.* Fertility studies were performed in female rats and revealed no evidence of impaired fertility or harm to the fetus due to scopolamine hydrobromide administered by daily subcutaneous injection. In the highest-dose group (plasma level approximately 500 times the level achieved in humans using a transdermal system), reduced maternal body weights were observed.

Pregnancy Category C: Teratogenic studies were performed in pregnant rats and rabbits with scopolamine hydrobromide administered by daily intravenous injection. No adverse effects were recorded in the rats. In the rabbits, the highest dose (plasma level approximately 100 times the level achieved in humans using a transdermal system) of drug administered had a marginal embryotoxic effect. Transderm Scōp should be used during pregnancy only if the anticipated benefit justifies the potential risk to the fetus.

Nursing Mothers: It is not known whether scopolamine is excreted in human milk. Because many drugs are excreted in human milk, caution should be exercised when Transderm Scōp is administered to a nursing woman.

Pediatric Use: Children are particularly susceptible to the side effects of belladonna alkaloids. Transderm Scōp should not be used in children because it is not known whether this system will release an amount of scopolamine that could produce serious adverse effects in children.

ADVERSE REACTIONS: The most frequent adverse reaction to Transderm Scōp is dryness of the mouth. This occurs in about two thirds of the people. A less frequent adverse reaction is drowsiness, which occurs in less than one sixth of the people. Transient impairment of eye accommodation, including blurred vision and dilation of the pupils, is also observed.

The following adverse reactions have also been reported on infrequent occasions during the use of Transderm Scōp: disorientation; memory disturbances; dizziness; restlessness; hallucinations; confusion; difficulty urinating; rashes and erythema; acute narrow-angle glaucoma; and dry, itchy, or red eyes.

Drug Withdrawal: Symptoms including dizziness, nausea, vomiting, headache, and disturbances of equilibrium have been reported in a few patients following discontinuation of the use of the Transderm Scōp system. These symptoms have occurred most often in patients who have used the system for more than three days.

OVERDOSAGE: Overdosage with scopolamine may cause disorientation, memory disturbances, dizziness, restlessness, hallucinations, confusion, psychosis, convulsions, bronchospasm and respiratory depression, and muscular weakness. Should these symptoms occur, the Transderm Scōp patch should be removed immediately, adequate hydration should be maintained, and appropriate symptomatic treatment initiated.

CAUTION: Federal law prohibits dispensing without prescription.

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SMITHSONIAN HIGHLIGHTS

In a virtual reality game at the "Microbes" show, a young visitor tries to protect healthy tissue from cartoonlike viruses.

Summer Science Nights

MICROBES AND MORE

"Microbes: Invisible Invaders . . . Amazing Allies," on view at the Smithsonian's International Gallery through September 6, inaugurates "Summer Science Nights on the Mall." During the run of "Microbes," the gallery, the National Museum of Natural History and the National Museum of American History will be open late every night until 7:30, and the National Air and Space Museum will be open from 9:30 A.M. until 6 P.M. daily. Both the exhibition and the evening hours are supported by Pfizer, Inc., in honor of its 150th anniversary. "Microbes" is an elaborate, colorful children's exhibition that explores infectious disease and how researchers and others fight it. The show includes virtual and 3-D animation, theatrical sets and special effects. From the Smithsonian, it will travel to Chicago and other cities around the country.

Folklife Festival

NEW HAMPSHIRE, ROMANIA, SOUTH AFRICA

The Granite State's stone-wall builders and Yankee fiddlers; Romanian icon painters and egg decorators; wire-toy makers from South Africa's urban townships; crafts booths and ethnic food stalls will be among the many attractions at the 33rd annual Smithsonian Folklife Festival. Cosponsored by the National Park Service, the festival will be held outdoors on the Mall, June 23-27 and June 30-July 4, from 11:30 A.M. to 5:30 P.M. Each evening, from 5:30 to 7, visitors are invited to kick up their heels at dance parties featuring traditional music.

Smithsonian Website

WWW.SMITHSONIANMAG.SI.EDU

Another place to start finding out about the exhibitions, events, publications, programs and activities of the Smithsonian is our Website. There you will find the *Highlights Calendar* with links to the many pages of the Smithsonian Institution Website.

Exhibitions, Events

ART NIGHT ON THE MALL

South Asian dance performances, music from Malawi, modern art from South Africa, films, a variety of children's activities and alfresco dining will be among the offerings at "Art Night" this year. Through September 2, the Arthur M. Sackler Gallery, the Freer Gallery of Art, the Hirshhorn Museum & Sculpture Garden and the National Museum of African Art will be open Thursday evenings until 8. In addition, on the third Thursday of each month the National Museum of American Art and the National Por-

trait Gallery are open until 8 P.M., through the end of 1999.

NEW THEATER, NEW CAFÉ

The National Museum of Natural History's new Discovery Center, one of the most ambitious construction projects in recent Smithsonian history, features a state-of-the-art 3-D IMAX theater, expanded museum shops and the 600-seat Atrium Café, situated under a 2½-story-high domed ceiling.

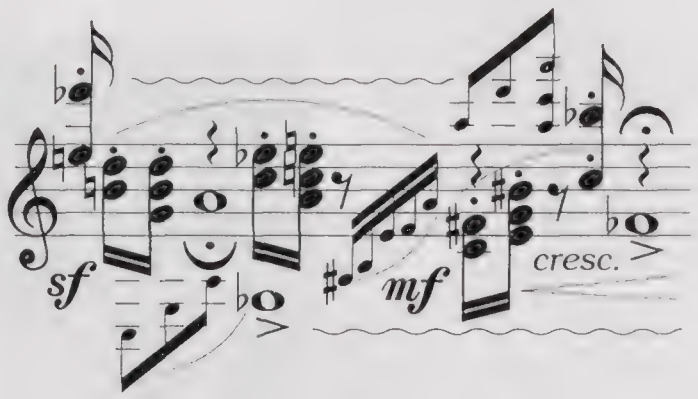
ENID A. HAUPT GARDEN

Under the Sun: An Outdoor Exhibition of Light (June 19-September 6) Created by the Cooper-Hewitt, National Design Museum, a festive exploration of solar technology.

Ceramics designs and traditions will be the subject of one of Romania's displays at this year's Smithsonian Folklife Festival.

ARTS AND INDUSTRIES BUILDING

From Bento to Mixed Plate: Americans of Japanese Ancestry in Multicultural Hawaii (through November 30) Personal artifacts, photographs and a small 19th-century locomotive from a sugar plantation.

Discovery Theater Live theater for

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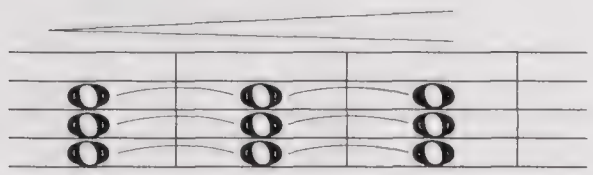
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[NEW YORK CITY]

The Huguenot Legacy: English Silver, 1680-1760 (through August 8) One hundred outstanding examples of 17th- and 18th-century English silver—from the world's most important collection of Huguenot silver—are on exhibit, from opulently decorated soup tureens to elegant wine coolers.

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This sauceboat made in London, c. 1742, is in "The Huguenot Legacy: English Silver, 1680-1760" at the Cooper-Hewitt.

Margaret Mee: Return to the Amazon (through August 15) Fifty watercolors by the British botanical artist.

NATIONAL MUSEUM OF AFRICAN ART

Claiming Art/Reclaiming Space: Post-Apartheid Art from South Africa (June 20-September 26) The many forms, ideas and emotions, social and political views, expressed by contemporary South African artists.

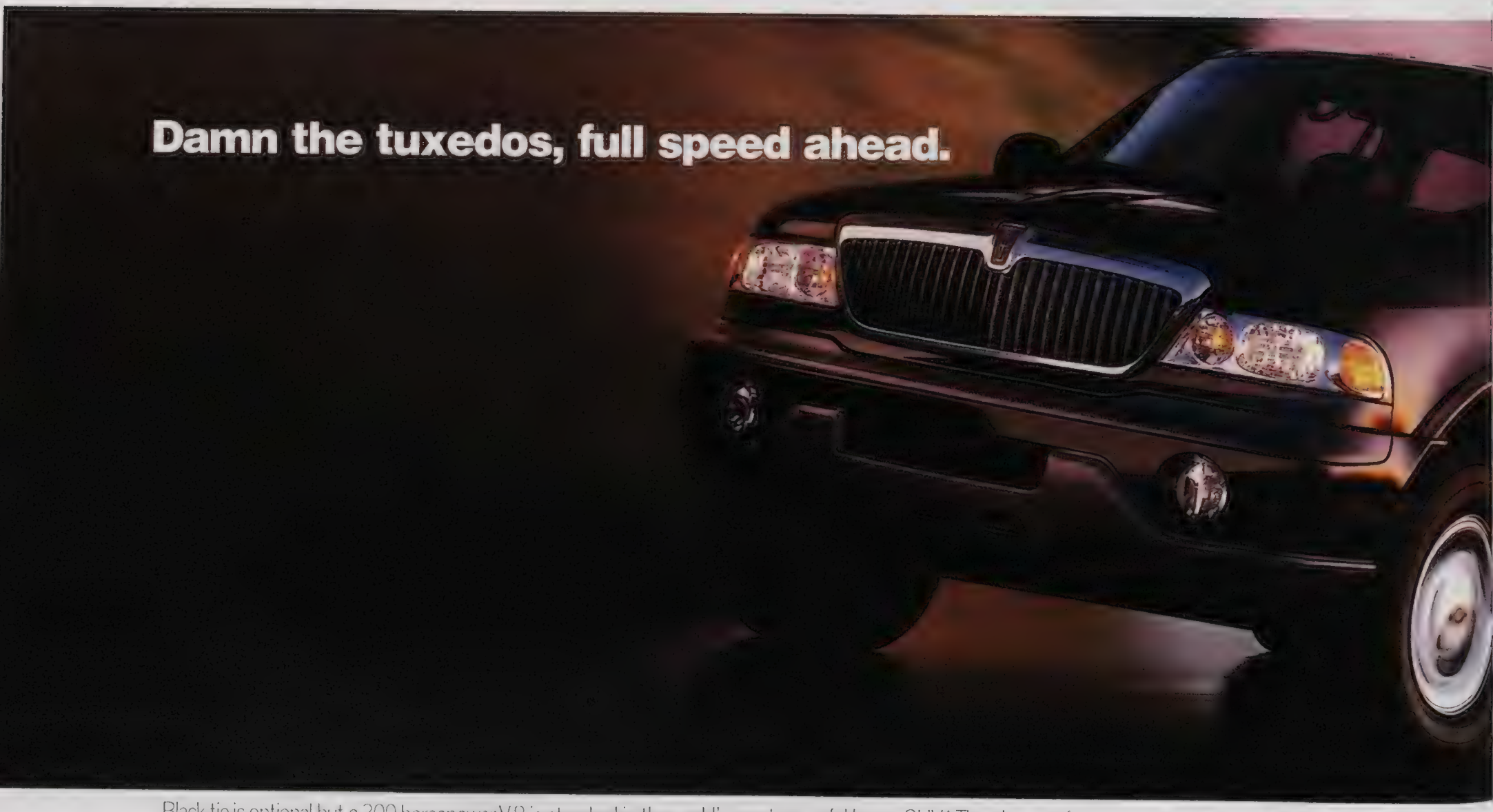
HIRSHHORN MUSEUM & SCULPTURE GARDEN

Brice Marden, Work of the 1990s: Paintings, Drawings, and Prints (through September 6) Evocative abstract works with weblike interlocking lines and sophisticated color.

NATIONAL POSTAL MUSEUM

The Graceful Envelope (through October 31) Seventy-five winners in the annual envelope design competition. This year's theme is the celebration of beauty in nature.

THE ALAN AND SIMONE HARTMAN COLLECTION



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ARTHUR M. SACKLER GALLERY

Devi: The Great Goddess (through September 6) See page 114. Free public programs of Indian music, dance and film are scheduled throughout the exhibition period.
Behind the Himalayas: Paintings of Mustang (through September 26)
Nainsukh: Painter from the Punjab Hills (through July 18)

NATIONAL PORTRAIT GALLERY

Franklin and His Friends: Portraying the Man of Science in Eighteenth Century America (through September 6) Portraits and the scientific objects depicted in them.

NATIONAL MUSEUM OF AMERICAN ART

Abbott Thayer: The Nature of Art (through September 6) Paintings and watercolors of winged figures, landscapes and camouflage in nature (see SMITHSONIAN, April 1999).
Picturing Old New England: Image and Memory (through August 22)

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Dominic Di Mare: A Retrospective (through July 25) Weavings, handmade paper, wall pieces, sculptures.

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The ups and downs of Highway 1

BY HEATHER MILLAR

PHOTOGRAPHS BY KIM STEELE

California's coast road offers a beautiful drive—but it keeps falling apart

ON A GOOD DAY, MY DESTINATION ON California's Highway 1 along the Big Sur coast is a two-hour drive from any sizable town, on two lanes of twisting asphalt tacked to a cliff face above the Pacific. During tourist traffic or bad weather, I've been warned, double the driving time or don't go at all.

In the early evening, I drive through a gate near the Burns Creek Bridge construction site. Camping trailers and pickup trucks are pulled into a circle like covered wagons, and beach umbrellas, tents and other relics of a months-long camp-out are scattered about. There's no TV reception or telephone, but a bit of luxury survives: an L-shaped, plywood shower stall with Astroturf flooring, complete with a propane water heater and a drop-dead view of a cove through the Monterey pines.

"Welcome to Camp Wannamoochee," says Coy Bright, one of the highway workers who choose to camp along the coast Monday through Friday rather than commute. "Have we given you the Moochee oath? Do you swear to eat red meat and only red meat? Do you swear that beer is both a fruit and a vegetable?"

We sit on lawn chairs and atop beer-filled coolers with a handful of other workmen. In an old washing machine tub, a fire of scrap plywood, particle board and nail-spiked two-by-fours exudes warmth and God only knows what carcinogens. Bright incinerates one Portuguese sausage after another over a cooking fire while the guys trade stories about swinging around on scaffolding hundreds of feet up, "feeling" the terrain in your seat while driving a 20-ton bulldozer on a landslide 500 feet above the surf, or maneuvering a *T. rex*-size backhoe in a lane only ten feet wide.

"Nothing is dangerous enough for us anymore," says pile driver Dave Porter as he stands bare-chested by the "Moochee" fire toweling his graying red hair after a Moochee shower. "If you don't have an adrenaline rush every day, you might as well go home."

Bright, blackening another sausage, half laughs. The scary thing, the unbelievably seductive thing, is that Porter is not really joking. For those who survive long enough to get good at it, the challenge of working on Highway 1 exerts a powerful pull.

Following the coast for 644 miles, from suburban Orange County in the south to the burg of Leggett in the north, Highway 1 stands as an asphalt metaphor for the Golden State. It links the "Baywatch" beaches of Los Angeles, the sheer cliffs of Big Sur, San Francisco's Golden Gate and the charm of Mendocino.

No wonder that, to many, Highway 1 defines California—the land of surfer dudes and loamy redwood groves, of barefoot hitchhikers and wispy starlets, of pastel cities and seaside villages. Most visitors drive at least one stretch of this road, named the state's first "scenic highway" in 1965 and declared one of the first "All-American Roads" by the Federal Highway Administration in 1996. It is estimated to bring in several billion dollars in tourism every year.

Keeping the road open—now that's a less sunny tale. Rather, it is a tears-and-beers saga, a never-ending repair job, an engineering Rubik's Cube. This thread of pavement is a thumb in God's eye. It cuts across unstable wetlands and leaps gut-twirling chasms. It skirts ecological preserves that require the dirty business of road building be held to almost surgical standards of cleanliness. It crosses slow-moving, but active, landslides. It weaves through webs of earthquake faults, including the San Andreas.

In a frank moment, the folks at the California Department of Transportation (Caltrans) might admit that Highway 1 goes where no road was meant to go. Being practical, as engineers and construction workers tend to be, they don't dwell on it.

Instead, careers are made devising solutions to keep the road clear: sensors that detect the movement of unstable ground, and a dizzying variety of walls, supports and nets to hold the earth back, the sea at bay and the road up. Always, there is maintenance: patching spots where the road sinks or buckles, brushing off the fallen rocks and sweeping away mud slides.

Hopping into a rented convertible on a sunny day in Orange County, it's difficult to focus on the travails of Caltrans crews. With the top down and a road atlas at my side, I notice its cover features a panoramic picture of Highway 1. Soon, I'm off to drive that road myself.

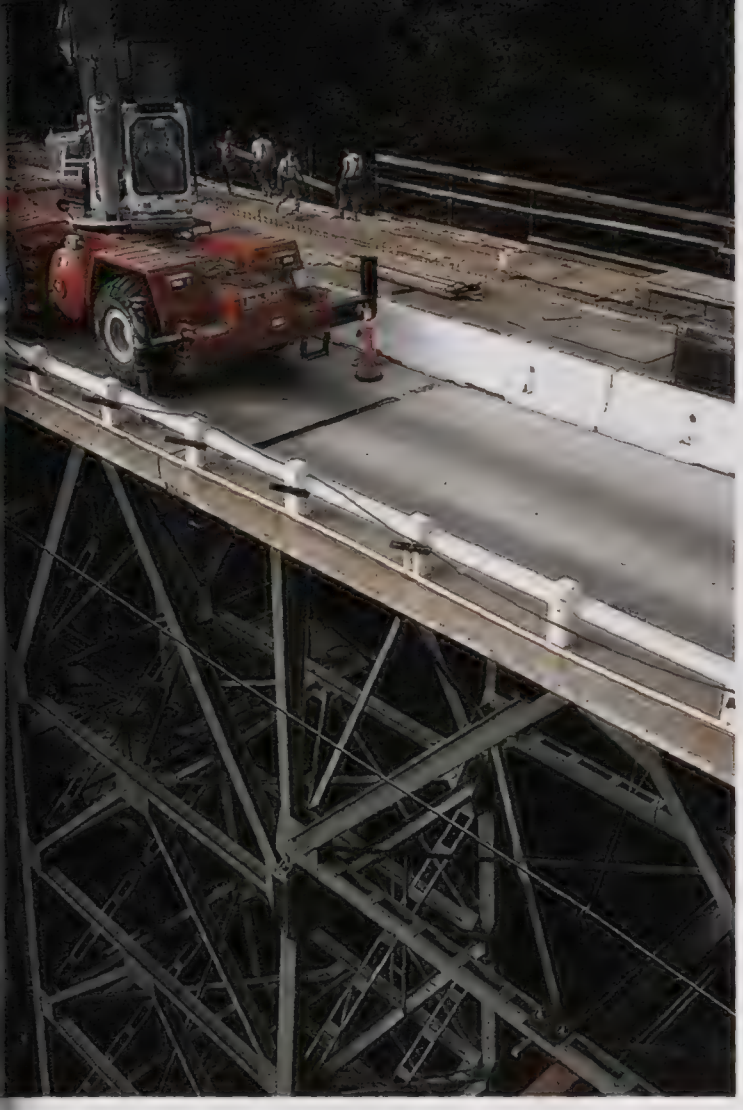
The highway begins at Dana Point, passing through fashionable towns and past palm-fringed beaches punctuated by lifeguard towers. At Huntington Beach, the fading sun silhouettes a surfer resting his long board against a fence. The radio—I'm not making this up—plays the Beach Boys' hit "California Girls." It is the ultimate American dreamscape.

About 50 miles north, I stand at the top of the Malibu bluffs early one July morning, enjoying the view of Santa Monica Bay. Only days before, this was the vantage point of two luxury houses, now gone. Around their

foundations, scraps of once-lavish landscaping lie beside broken bathroom tiles and utility bills. The owners left in a hurry.

For more than a week, Caltrans crews tried to shore up this headland rising 200 feet above the Pacific Coast Highway, or "PCH," as Highway 1 is known in Southern California. But the land kept dribbling toward the highway and finally let go in one

Keeping Highway 1 open requires heavy equipment, fearless workers and simple ingenuity. Clockwise from top left: Straw bales hold back erosion; a crew replaces the 64-year-old Burns Creek Bridge; a bulldozer razes a Malibu house; workers unload a crane hook.



huge slide, leaving the two houses teetering dangerously. Once the residents were safely gone, Caltrans workers quickly knocked everything down before all that elegance tumbled onto the coast road.

Caltrans has its own language: "landslides" are what happen above the road; "slip-outs" happen below. Geology makes them both inevitable. California straddles two of the slowly moving tectonic plates that make up the earth's crust, the Pacific plate and the North American plate, which are constantly grinding and pulling apart. As they do, they pulverize rock, produce spidery earthquake faults and create all sorts of problems for Caltrans. This geologic movement has created thick layers of soft siltstone and mudstone that lie beneath much of the photogenic coastal sage scrub and California poppies. This weak soil, in turn, rests upon deeply weathered bedrock. When winter brings heavy rain, the upper sediment layer gets saturated, growing heavier and heavier. Finally, the smooth base layer can no longer hold the topsoil in place. It slides, taking the road with it.

"The hills," quips Robert F. Joseph, Caltrans planning chief for Orange County, "naturally want to gallop toward the sea."

Each time they do so in Malibu, yet another "grading plan" is devised that determines the contours and angles of the new grade to be sculpted by legions of dozers and backhoes. In 1998 alone, slides closed PCH in Malibu for a total of 21 days. Farther north, other Caltrans engineers cope with dozens of small slides and a few huge ones that close portions of the road for periods that range from a few hours to several months. Sometimes the failures are catastrophic. In 1983, along the Big Sur coast, a mountain plunged into the sea, and Caltrans had to cart away a chunk of landscape that once soared 1,000 feet above the road. That job took 11 months. In the same area another slide buried a bulldozer operator.

Caltrans people don't like to discuss accidents. It's a professional superstition, akin to old notions of attracting the evil eye. They've all heard the stories: the startled supervisor killed when he ran into a slide's path, the worker fatally struck by a car while fixing a guardrail. During the El Niño winter of 1997-98, tales traveled the coast: the bulldozer operator who "skied" his machine down a slide, the geologist whose legs were crushed in a run-in with a dozer. Caltrans workers listen, acknowledge the danger, and push it aside.

That's the ethic of the guys who each weeknight sit around the campfire at Camp Wannamoochee. With macho eagerness, they regale me with their exploits but change the subject when asked about the risks; any topic will do. Tom Renner, nursing a cold and huddled against the foggy chill, talks about medicine. Thin, wiry Rudy Muñoz, whom the guys call Moochee Mayor, turns to his visiting wife and kids: "Hey, what videos did you bring?"

Coy Bright stares at the dusty ground. How does his wife in Corbett Canyon, two hours down the coast, feel about his dangerous high-bridge job? Does he talk to his 4-year-old son about the work he does? Bright runs an oil-burnished hand through his blond hair. "Hey, the bills get paid," he quips. "If you're not scared of heights, you're stupid. You have to have respect, OK? But if you're that worried, you shouldn't be up there."

Bright's well-worn hard hat, scratched

Highway 1 trouble areas include: Malibu; the Big Sur Coast; south of San Francisco; and south of Fort Ross. Coy Bright (inset) specializes in bridge falsework.

and dusty, sits on the front seat of his pickup, a few yards away. Earlier I had noticed a hairline crack. What is he going to do about the crack? Is it safe? "I don't want to talk about it," Bright snaps, the jokester turned uncharacteristically sharp; then he softens. "Look. I've had that hard hat for ten years. A lot of jobs. It's a part of me, my protection."

He pauses, wraps a grilled tortilla around a blackened sausage and takes a bite. "When we pour the deck on the second half of the bridge, maybe I'll throw the hat in, as a memorial," he says. None of the rough-hewn guys around the campfire mock this sentimentality, not Muñoz, not Renner who operates the equipment, not Porter the pile driver, not the Caltrans inspector who could no longer stand the commute and is camping out for the first time. They've been there. They understand.

Pride, as well as powerful financial and political pressures, demands this stoicism. The coast highway through Malibu forms part of the high-rent district where zippy Porsches sport vanity plates like "4 HWY 1." Many movie stars live off the route: Barbra Streisand, Jack Nicholson, Cher. Up north toward Carmel, the names are no less prominent, just less glitzy: Ted Turner owns property along the road, as does pianist-conductor Vladimir Ashkenazy. These people expect to be able to get to their driveways.

Bright sees such folks pass his work site every day. "What a lot of people don't understand is that guys like us are supporting a lifestyle," he says.

It's the day the crew is scheduled to finish the first half of their bridge, the northbound lane. Bright strides forcefully across the bridge wearing an orange safety vest, khaki shirt and camouflage pants. A walkie-talkie clipped to his shoulder crackles to life. "Gotta let these people through," a voice says. "OK!" Bright says into the microphone.

A front-end loader backs off the bridge, clearing the one usable lane. Slowly, traffic begins to move across: Maseratis, Lamborghinis, Alfas.

"Niiice," Bright says as the parade of status cars purrs by.

The gated estates and three-story picture windows of the elite get fewer as I continue my journey north from Malibu. Then, just over the Ventura County line, the cliffs rise like slate-gray walls from the inland shoulder. "Falling Rocks," the sign says. Then another sign repeats the message, and another. It's a bit ominous to someone driving a convertible.

Rocks fall on many roads, but they pelt hundreds of miles of Highway 1. Any weather change—from hot to cold, from calm to windy, from dry to wet—can cause bits of the cliffs to pop loose and tumble onto the asphalt. Depending on who's talking, the cliffs "spit," "cough" or "puke" rocks. Most who work the coast have a rock anecdote. There are the endless flat tires they cause or the rare fatality.

At Point Mugu, Caltrans first tried running an earthen berm along the inland shoulder to keep rocks from rolling onto traffic lanes. But it took up too much room, and now a more drastic measure is planned: covering the rocks with a net of woven steel, a method used to veil other cliff areas along Highway 1. But the solution isn't an easy one. Heavy rolls of netting are delivered to the cliff top, where they are secured with steel anchors. The mesh is unfurled over the rough, craggy landscape. Then, mountaineering crews rappel down the cliff, fastening together the lengths of cable netting with metal rings. It should work here in Ventura County.

C. J. Caswell has no doubt been stuck in traffic as one of those rock nets was installed. On a foggy summer evening, she sits next to me in a Morro Bay hotel bar. I mention Highway 1. That, as it often does, brings forth stories. She lives in her camper along the coast, she says. She's divorced, the kids are grown and she loves the scenery, loves the remoteness. Unlike schedule-bound tourists, Caswell takes the Caltrans delays philosophically. "I always pack a cooler when I'm driving 1," she says. "That way, if there's a problem, I just eat a sandwich and enjoy the view."

Every road project that makes Caswell reach into her cooler invokes an environmental penance. Storm-swollen creeks want to go west, and spawning steelhead want to go east, but Highway 1 runs perpendicular to this flow, skirting protected areas: national marine sanctuaries, seashores and forests, as well as state ecological preserves, parks and beaches.

As a California native, I've probably crossed over Pico Creek a dozen times. I've never noticed this unprepossessing stream that trickles into the Pacific just south of William Randolph Hearst's opulent estate, San Simeon. A hundred years ago, most coastal canyons, or "arroyos," supported streamlets like this. Today, in the more developed areas of the coast, many of the creeks have been diverted, dammed or "channelized" with rocks and concrete. As a result, environmentalists now treasure Pico Creek like a rare collector's piece, for it provides ideal habitat for three members of the Endangered Species List: the tidewater goby, the steelhead and the California red-legged frog.

When Caltrans decided to replace the bridge over Pico Creek, the engineers must have groaned. Highway 1 places tremendous demands on bridge builders. Again and again, 200- and 300-foot-deep canyons slice under the road's path. Not only must the bridges master this landscape, they must also do no harm. Most bridges are built from the bottom up, but not on Highway 1. At Burns Creek, where the Camp Wannamoochee guys labor, the team worked from the top down, since no heavy equipment could touch the protected creekbed. The men morphed into industrial puppeteers, dangling machinery from the edge of the old span.

After a Moochee dinner one summer night, Coy Bright pulls out a stack of photographs of the early Burns Creek work. Construction people take a lot of pictures. They say it's because if something goes wrong, it's always good to have pictures when and if the liability case goes to court. It's also because they're proud.

"See here?" he says, pointing to a snapshot of steel beams and cables, the "falsework" that supported the new bridge as it was being built. "We had to invent new ways to tension it, to keep it stable.

"I've been interested in this project for six years," he says of Burns Creek. "Why? Because this job is one of the most difficult jobs we're ever going to face." The other guys around the Moochee fire nod.

Bright, Porter and several of the Wannamoochee crew are veterans of Pico Creek. There, the challenge was the old 674-foot span that sat on 16 piers, several standing in the water. Replacing them would mean damming the stream, clearing frog-and-steelhead-friendly willows from large stretches of riverbank as new pier foundations were poured: a holocaust for the creek's endangered species. So engineers performed mathematical gymnastics, designing a bridge with just four supports, and none of them in the creek.

An augur drills a hole for a pile, to strengthen the Rocky Creek Bridge against earthquakes.

Crews cleared a construction site as narrow as possible and installed fences to keep backhoes and dump trucks from straying onto protected habitat. Silt fences and hay bales acted like giant coffee filters during winter storms, allowing water into the stream but trapping silt that could destroy tidewater goby habitat or make it too shallow for the red-legged frogs to escape raccoons by diving into deep water. When they poured concrete, the crews used huge plastic "diapers" to keep the wet

Along the Pacific Coast Highway in Santa Monica, landslides caused by heavy rains are a chronic problem.

muck from dripping into the Pico.

Coy Bright remembers well the day they poured the first concrete piling there. "I was 40 feet down in a hole, and somehow this little frog got down there. I couldn't kill it, not after all the fuss. So I stuffed it in my shirt. Kept it there for three hours."

"Nature boy!" someone jibes.

"Hey, don't laugh! I kept the froggie population numbers up," Bright says. Then he laughs, too.

"They did a good job," says research biologist Galen B. Rathbun as he kneels below the new Pico Creek Bridge. A slender, soft-spoken man, Rathbun has worked for five years with a U.S. Geological Survey team monitoring the Pico and other Highway 1 creeks to see how road construction affects ecosystems. He wears big earphones, and on the ground in front of him sits a radio receiver. One hand fiddles with a dial; the other holds an antenna aloft. He is tuning in red-legged frogs, each wearing a small transmitter attached to a key chain around its middle.

While Rathbun listens intently, a landscaping detail is busily covering the old construction site with 63,000 native plant seedlings.

Beep-beep-beep. Rathbun's radio receiver has picked up a frog. Soon, the red-legged amphibians will again be hopping under the Pico Creek Bridge. I'll never again drive past this stretch without thinking of them.

About an hour's drive up the road, I come to a place known locally as Rain Rocks. Two 80-ton drill rigs grind away at a rock cliff, making an earsplitting growl and groan. Here the highway tacks itself to a cliff face, requiring constant repairs. The drills, superhero-size corkscrews, will help anchor a new viaduct.

A textbook assortment of barriers and supports helps Highway 1 hang onto difficult terrain: "soldier pile" walls use steel-beam uprights to support timber or concrete crossbeams that hold back sliding earth. "Can" walls use rock-filled, vertically positioned culvert pipe to support sagging road. "Crib" walls, which look like concrete corncribs filled with rocks, rely on weight to provide stability. "Tieback" walls anchor horizontal steel cables into bedrock, holding the road in a bear hug. When all else fails, Caltrans employs an even more expensive and labor-intensive solution: the viaduct. A viaduct is essentially a bridge built over land. Piers drill down into bedrock, providing support for cars and asphalt where the landscape is otherwise too steep and unstable to carry them.

At Rain Rocks, the viaduct has demanded more than anyone ever expected. To push Highway 1 out ten feet, the ridge requires 30 piers. It was estimated to take just a few months to ream out the pier holes; that was more than a year ago.

The rock here is hard, wearing out $80,000 worth of carbide drill inserts that aren't supposed to wear out. The rock is also fractured, and often the cliff collapses in on the drill hole.

But Rain Rocks has always been a problem. Just ask Don Harlan. Everyone along this remote stretch of coast knows Harlan, 74, who raises Black Angus about three miles north of Rain Rocks on the ranch his parents bought during World War I. He maintains a crotchety, but oddly charming, independence of a sort all but extinct in California today.

Some tell war stories; Harlan tells Highway 1 stories: of slip-outs, of earth turned to liquid, of bits of hillside that never stop sliding. Years after he retired from his job with Caltrans, Harlan still wears work boots and a hard hat everywhere he goes.

"I don't do much housekeeping,

Near the northern end of Highway 1, the road curve (background) was the site of a huge slip-out that took six months to repair.

and I don't apologize for it," Harlan says gruffly as he opens the door. "Coffee?" He puts on a pot to boil. Sure, he remembers them building Highway 1, he says warily. "My dad fought it: they paved part of his field," he continues, throwing a strip of teriyaki jerky to his aging terrier, Spotty. "I still remember watching the road work. The roughest job was here at Rain Rocks where they're fixing it now," he says, growing more enthusiastic as he talks about the road. "That's a solid rock cliff that used to be straight off into the ocean."

Before the hardscrabble crews that Harlan remembers started to work, the coast route was a spotty, disconnected collection of horse and wagon trails, county and city roads, and rail lines. The most remote areas—the Big Sur coast and the Mendocino coast up north—had nothing remotely resembling a major road. So perhaps the highway would never have been built if not for the 1915 state Convict Labor Law, which allowed prisoners to work on state roads in return for fresh air and time off for good behavior. The prisoners readily volunteered for road duty.

Beginning in 1919 and continuing through 1980, sections of Highway 1 were gradually adopted into the state system. As a result, the road is also known by different names in different places: it's the Pacific Coast Highway in Southern California; then, north to San Francisco, it's called the Cabrillo Highway, after Juan Rodríguez Cabrillo, the first European to discover California, in 1542. There's also the San Simeon Highway from San Luis Obispo to Carmel; the Golden Gate Bridge Freeway, through San Francisco; and Shoreline Highway, in the far north of the state.

Men won each of these segments with hundreds of acts of heroism, and even today Highway 1 demands extreme dedication from the laborers who struggle to keep it open. Asked about it later, Coy Bright admits he must have been nuts to free-climb the Rocky Creek Bridge at night.

While Caltrans was retrofitting the structure against earthquakes last year, a 32-ton crane flipped off the bridge, a graceful concrete arch from which tall spandrels rise to support the roadway. Hooked by the curb and a bit of guardrail, with the boom wedged against the bridge arch, the crane hung forlornly for three days, slipping inch by inch. Ominous possibilities loomed: a falling crane could injure workers and damage the bridge, closing the road for months and fouling the ecosystem below.

"My boss got a phone call," Bright says. "He told me to leave Burns Creek and go. I hate to risk my life for someone else's stupidity. But it had to be done." Highway 1 in Big Sur was closed during the height of the summer season, and both locals and tourists were clamoring for a fix.

That night, with a safety rope wrapped across his chest, Bright scrambled catlike through the darkness up the arch, toward the place where he could guide the steel cables to lash the machine to the structure until sunrise. Following the upward arc went so smoothly that he remembers admiring the craftsmanship of the 67-year-old bridge.

Going down was different. Gravity tugged urgently, and each footfall felt slippery and uncertain. The bridge design made it impossible to move along the arch while tied off with climbing gear and buffeted by 30-knot winds. Bright was jarred back to reality as he listened to the moaning sounds of the crane inching its way off the span above the rocks and surf 170 feet below.

"I thought of my wife and kid. All of a sudden, I realized that climbing

Workers at the Rocky Creek Bridge site consider how best to lift a crane that has flipped and is slowly slipping off the edge.

that bridge was not a good idea," says Bright, weeks after the crane was salvaged. "Still, we got the road open."

The day after Bright successfully secured the crane, I stand on a promontory just above Rocky Creek Bridge. Workmen clamber over the two enormous cranes driven from San Francisco to lift the disabled crane and set it back on the bridge.

Caltrans engineers consult in little knots; a state game warden directs workers to protect the creekbed. Reporters jockey for position. Ambulances and fire trucks stand by, just in case. A satellite-phone hookup enables officials to beam regular updates to the outside world. Neighbors drop by to gawk.

It will be four more hours before the crane can be lifted safely back onto the deck, another day before the bridge is cleared. A mile north, vacationers in campers sigh and berate the orange-vested Caltrans flaggers manning the roadblock. "Wasn't this road already closed most of the winter?" one fumes.

El Niño did indeed hit hard. Severe storms regularly pound the California coast. The 1997-98 winter's damage is still evident as I drive north away from Rocky Creek toward Carmel. Water is enemy number one to any road, and storm runoff has the power of a sandblaster. As storm after storm together dumped 80 inches of rain last year, this section of Highway 1 was totaled. In all, the highway was closed, washed out or damaged in more than 40 places along the 70-mile stretch between the San Luis Obispo County line and Carmel.

Driving it the following summer, Highway 1 looks brand new. My sleek convertible—I'll be sorry to return it to the rental company—purrs over the smooth surface. If I hadn't been interviewing construction workers for weeks, I would never have noticed the 40 miles of road that had been repaved along the Big Sur coast; or that at many channels cut by a creek or drainage the road fill had been rebuilt with layers of earth separated by geogrid, a plastic matting that reinforces soil. I wouldn't know to look for restored drainage systems: more than 100 new culverts, debris traps and down drains. I might notice the pipes angled down grade faces, but I wouldn't understand that they channel surface water to reduce erosion.

Just weeks after the last culvert repair, California poppies poke up through the erosion-control straw matting that drapes the slopes. In a few months, no one will remember that up to 300 men and women worked 16 hours a day for five months to make it look this way.

Yet even a neophyte could spot problems along a three-mile section south of San Francisco called Devil's Slide. Landslides have washed out the road so many times that the roadbed has slipped 20 feet down the cliff.

The state and the residents of nearby towns have argued over the Devil's Slide problem for years and have finally agreed on a solution: a tunnel to bypass the most unstable section. The $135 million needed to make this plan a reality, however, has yet to materialize. In the meantime, Caltrans Maintenance Supervisor Louis Mateo will continue to make a weekly check at the "Zoo Cage." He takes me along one day.

He parks his orange Caltrans truck on a disconcertingly narrow slip of shoulder on the seaward side. It feels unstable, but surely that's just my overworked imagination. Caltrans crews have pounded 300 steel rods 30 feet down to bolster the roadway.

Proudly, Mateo points out all the bells and whistles. A steel enclosure protects three metal boxes of circuit boards. The computer system, Mateo explains, connects sensors that wire this stretch of road like a bank vault: three "slope inclinometers" to measure whether the angle of this slippery slope has changed; six wire loops embedded in the road to detect small movements; seven others to register larger shifts. Even the rock net cover-

MIKE KEPKA/MONTEREY COUNTY HERALD

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The graceful Russian Gulch Bridge north of Mendocino spans 526 feet.

ing the crags rising from the road has been fitted with electronic alarms.

If any of these instruments detects a slip of an inch or more, an antenna rising from the Zoo Cage will send an alert to the Caltrans district headquarters, where the authorities will direct Mateo to investigate and close the road if necessary.

"No, we haven't closed the road yet," he says. "But we're ready."

After leaving Devil's Slide, Highway 1 goes through the cheery clamor of San Francisco, across the Golden Gate Bridge and past the tony communities of Marin County. The road jogs back to the coast at a place aptly called Slide Ranch, where the pavement has slipped and been patched so many times it reminds me of roads in Mexico and Tibet.

North and north, where Highway 1 edges the temperate redwood rain forest, the stories are much the same. Storm runoff at Tomales causes flooding. Storm surge from the Russian River scours out a lane. A huge landslide closes the road at Fort Ross, the historic stronghold of Russian trappers. Several slips at the Navarro River require two can walls, one 540 feet long and another 120 feet. The minor slides, small failures, cracks and potholes number far too many to list.

Highway 1 passes its last bit of coast at the mouth of Hardy Creek, deep in redwood country. Caltrans engineer George Otterbeck pulls his minivan up to a staging area overlooking the creek. After a day spent listening to Otterbeck slam bureaucracy, sentimentality, yuppies and just about anything else that comes up, I know better than to exclaim about the view. Inside, I gush.

At low tide, when we arrive, a narrow strip of sand hugs a Franciscan schist bluff. In the distance, the tips of redwoods stitch earth to sky. You can walk out into the surf and just pick abalone off the bottom, Otterbeck is saying. It's wildly, ruggedly beautiful, just beautiful. The Pacific Ocean (the name seems inappropriate here) attacks the land. "In the winter, the waves rise 30 feet up. They're gorgeous," says Otterbeck.

But even in this setting, the waves are slowly chewing at the cliff base, undercutting the road 180 feet above, and I see Caltrans crews building barriers of rocks and eight-ton boulders along the beach to absorb the impact.

"It's taking forever, but it just wouldn't have been cost-effective to realign the road," Otterbeck says as we climb back into the minivan. He speeds north from the beach, following an empty rock truck inland toward the redwood forest and the highway's northern terminus.

But it is my last view of the ocean that lingers with me during the final miles of my drive up Highway 1. The scene brings to mind one of Coy Bright's rationalizations for his Camp Wannamoochee existence: "It's a drag to be away from our families. I adore my wife and kid. But the view—I've got the same view as a millionaire."

Heather Millar lives in Pacific Grove and has written for the Atlantic Monthly *and the* New York Times Sunday Magazine. *Kim Steele is based in San Francisco.*

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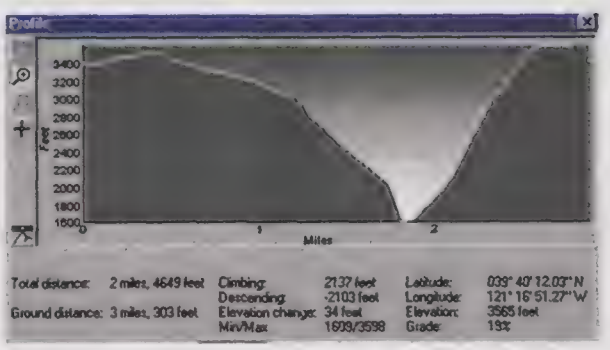

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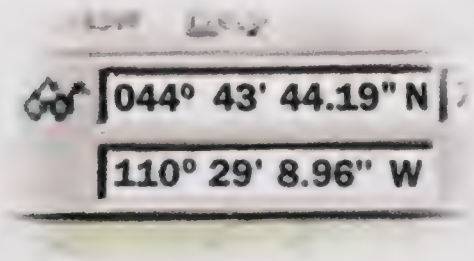

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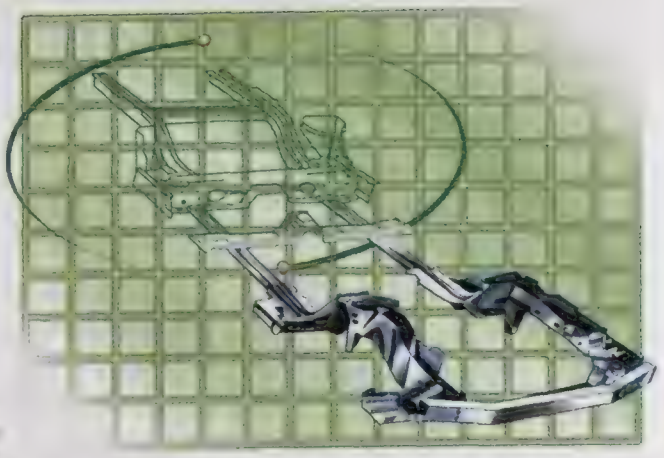

Q. If we sent an engineer to a racetrack, would he bring us back a smooth ride? Q. If he looked into a mirror, would the reflection be aerodynamic? Q. If we're rigid about frames, are you flexible in corners? Q. If your seat were pressure mapped, are you comfortable with that? Q. If your battery had been relocated, would there be a difference under the hood? Q. If your cab went forward, could your trunk get larger?

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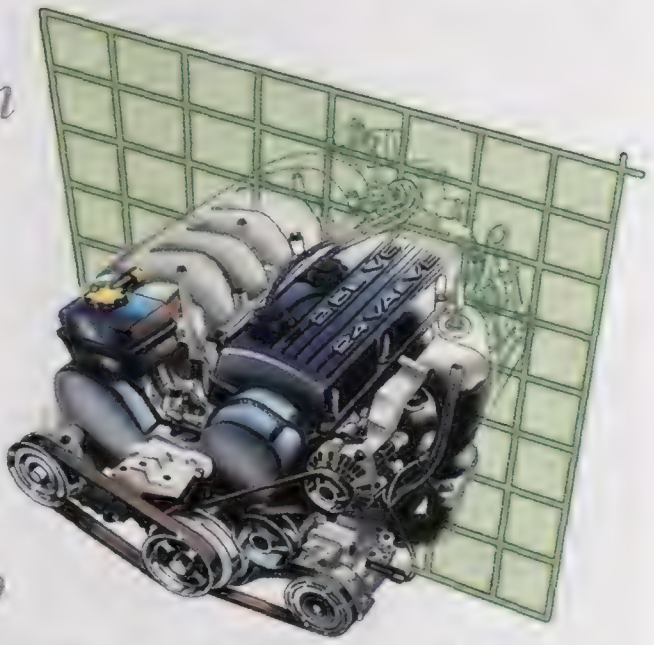

Q. If you stomp on the gas, can your steering become more precise? Q. If your option is automatic or *manual, is both an acceptable choice? Q. If we filled an engine mount with liquid, would that help make things quieter? Q. If your wheels were moved to the corners, would that help you round the next curve? Q. If we were to paint a car with powder, would that help protect it from flying gravel? Q. If we used a ladder, would that be a solid foundation on which to build a car? Q. If the hood were sloped, would the wind notice? Q. If we engineered for handling, could it handle a trip to the mall?*

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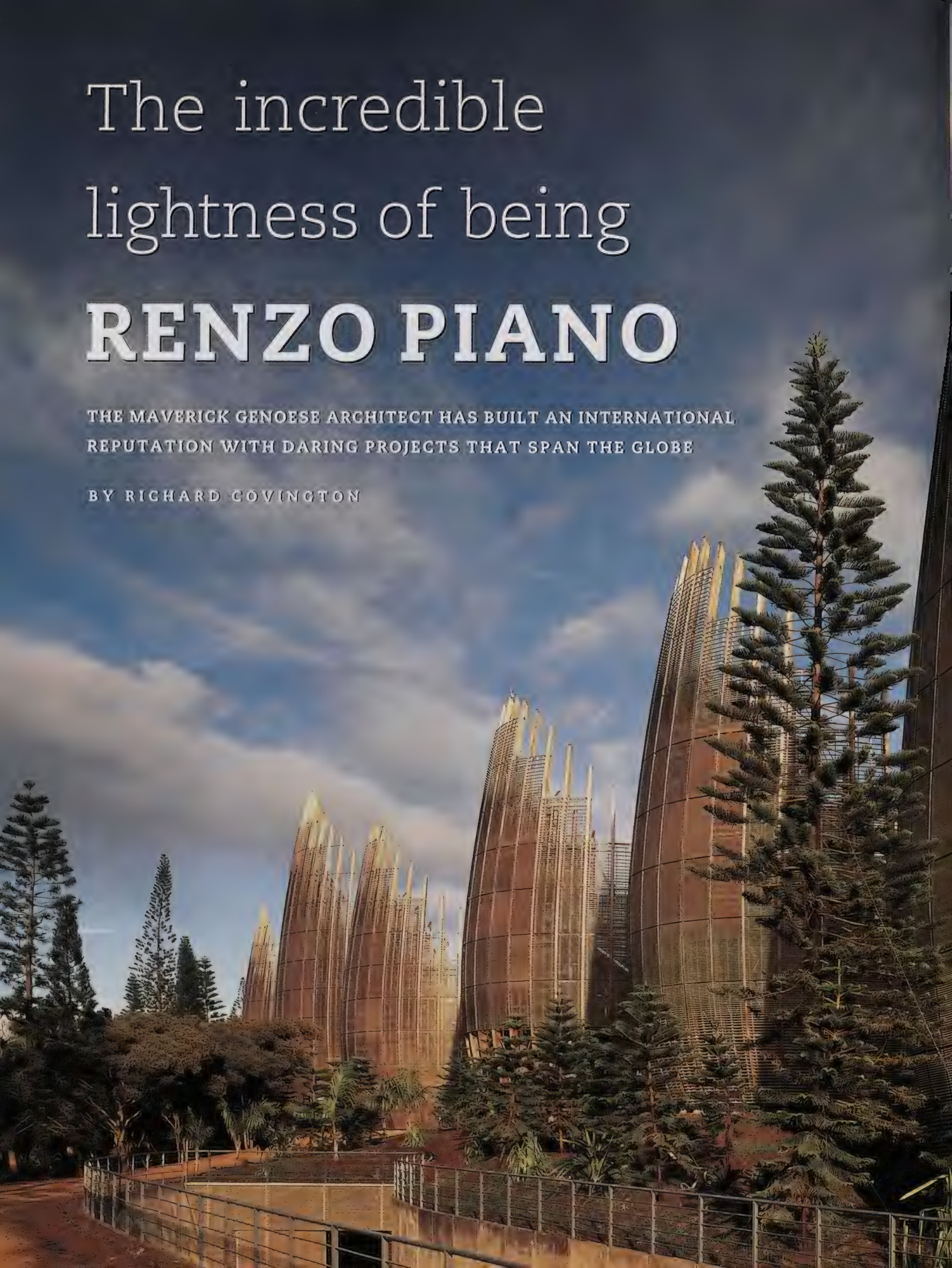
RENZO PIANO

THE MAVERICK GENOESE ARCHITECT HAS BUILT AN INTERNATIONAL REPUTATION WITH DARING PROJECTS THAT SPAN THE GLOBE

BY RICHARD COVINGTON



The striking wooden forms of the Tjibaou Cultural Center in Noumea, New Caledonia, were inspired by indigenous Kanak designs and beliefs.

THE IBM EXECUTIVES WERE SKEPTICAL. THE POLYCARBONATE PLASTIC PYRAMID THAT ARCHITECT Renzo Piano had lugged into the Paris offices looked far too fragile. After all, it had to serve as the fundamental building block for the company's new traveling exhibition pavilion, not as some flimsy circus tent. Fortunately for Piano, he had come prepared. Blue eyes gleaming behind wire-rimmed glasses like a gleeful Rasputin, the black-bearded architect set the pyramid on the floor, hauled out a sledgehammer and delivered it a crashing blow. The pyramid wasn't even scratched. Later that day, Piano got word that his design for the pavilion had been approved.

That was in the spring of 1983, when the Genoese architect was an obstreperous 45-year-old. Now, 16 years older and only a tad less obstreperous, but just as obstinate, Piano, the 1998 winner of the Pritzker Prize, the equivalent of a Nobel Prize in the field of architecture, rarely resorts to such drama to prove his point. These days, he prefers comedy.

Piano's beard may have turned an avuncular white and his rumpled hair gray, but he still cuts a trim, energetic figure. Dapper in blue workshirt, khakis and no tie, the architect is presiding over a recent meeting at Punta Nave, his workshop on Italy's Ligurian coast. Clients, architects, construction engineers and builders have converged on the workshop to discuss a 38-story office tower for Sydney, Australia, that will be enveloped by a massive translucent "sail," a dramatically innovative design that has the dual purpose of capturing sea breezes off the harbor and at the same time echoing the sail-like chambered-nautilus roof of the city's signature opera house 2,600 feet away. It is classic Piano, a fundamentally practical and graceful gesture intended to complement rather than upstage the existing skyline.

The clients are concerned that pedestrians may knock off some of the ground level "baguettes," the terra-cotta strips that run horizontally along the building's facade. When one of the Sydney builders suggests starting the strips higher up the building, Piano playfully pulls his pant legs up from his leather-topped boating shoes and toddles about like Charlie Chaplin.

"If we do that, your building will look like it has on shorts," deadpans the architect, amid general good-natured laughter.

Shining through his unflappable charm, engaging sense of humor and wry self-effacement is a will as tough and resilient as the polycarbonate pyramid of long ago. As usual, Piano gets his own way, and he gets it without making anyone else regret not getting theirs.

Ever since 1977, when Piano and British partner Richard Rogers shocked the architectural establishment with the Georges Pompidou Center, that parody of high-tech design moored in the 18th-century heart of Paris, he has relished and exploited his role as maverick. With its jaunty red, blue, yellow and green exposed ducts and a covered esca-

PP. 62,63 TIM GRIFFITH/ESTO

lator snaking up its transparent facade, the Pompidou, also known as the Beaubourg, is now one of the most recognized landmarks in Paris. A five-story cultural complex covering more than a million square feet, the center contains a museum devoted to modern art, temporary exhibition spaces, cinemas, a concert hall, traditional and multimedia libraries and archives, and a spectacular rooftop view. With 25,000 visitors a day, the Pompidou soon became the most-visited building in the city and is now closed for sorely needed renovations and a thoroughgoing makeover.

Under Piano's supervision, the cavernous entrance hall will be filled with a new café and media center; a separate entrance for library patrons will reduce long waiting lines; and the charmless rooftop eatery will be spruced up into a fancier, full-service restaurant. The center is scheduled to reopen for the millennium, rather theatrically on the stroke of midnight December 31, 1999. Given the architect's record for punctuality, you can bet it will.

French president Georges Pompidou chose Piano and Rogers, both in their early 30s when the Pompidou commission was awarded in 1970, because he wanted to make a bold architectural statement. With the Piano-Rogers design, he got his wish and then some. The Pompidou Center attracted controversy the way the former nearby food market of Les Halles once drew three-star chefs. French steelmakers insisted that the girders the duo had designed would collapse and refused en masse to build them. Piano and Rogers did the unthinkable: they hired German contractors who delivered the girders under cover of night.

When President Valéry Giscard d'Estaing followed his rival Pompidou into office, he tried to persuade the architects to lop the top floor off the as-yet-unfinished building. Refusing to be intimidated, Piano replied diplomatically that it was not possible to change the design so late in the process. The top floor went up as planned.

Even at the Pritzker ceremony, held last June at the White House, Piano was careful to remind President and Mrs. Clinton and the assembled guests what a die-hard iconoclast he remains, prize or no prize.

The jury, Piano noted with a touch of tongue-in-cheek

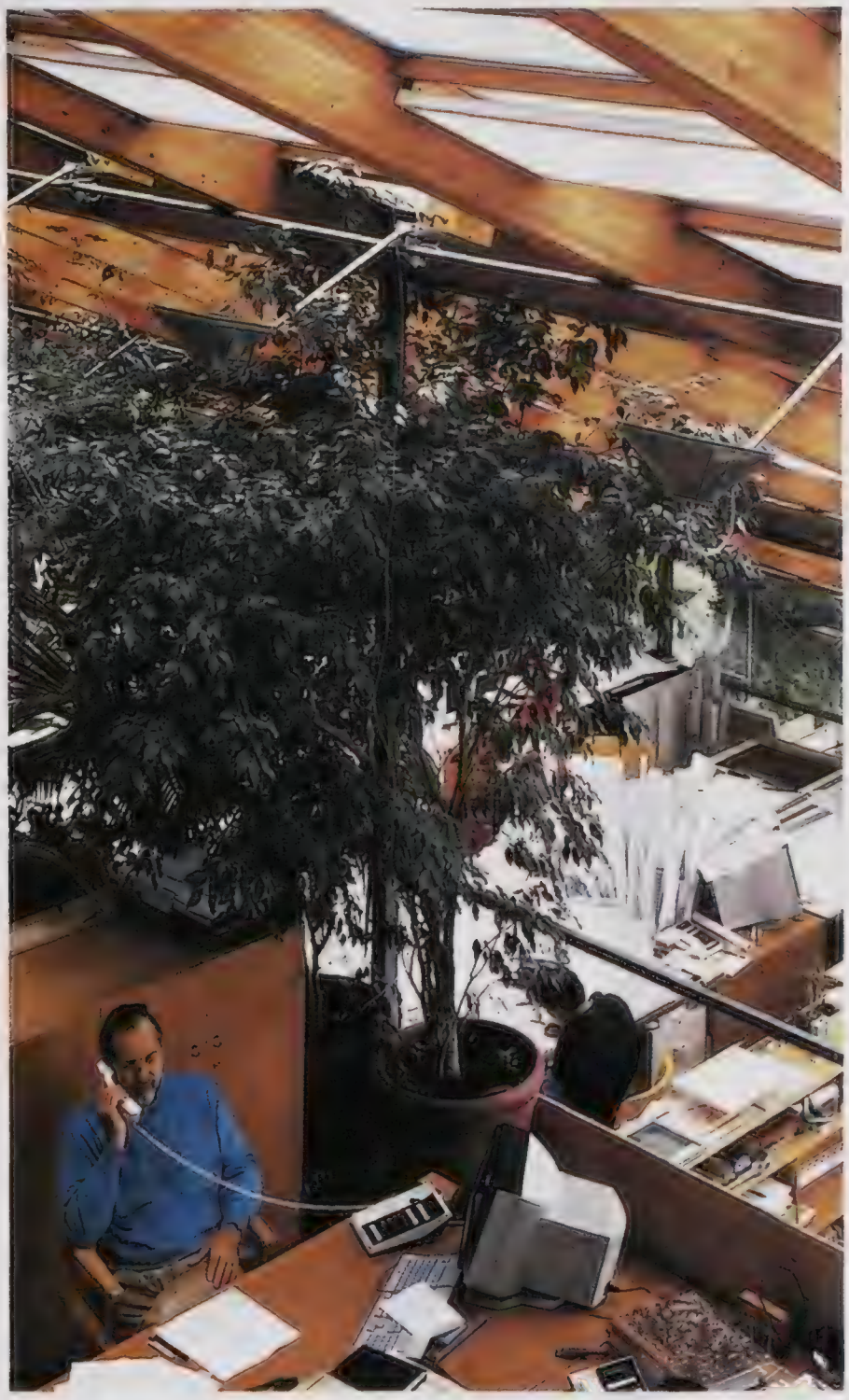
RICHARD BRYANT/ESTO/ARCAID

In 1977, Piano and British partner Richard Rogers shocked the architectural establishment with the Georges Pompidou Center. With its jaunty red, blue, yellow and green exposed ducts and a covered escalator snaking up its transparent facade, the Pompidou is now one of the most recognized landmarks in Paris.

irony in his voice, "has taken on a tremendous responsibility in opening the doors of the temple to someone like me who has always lived outside of it."

Jury chairman J. Carter Brown, director emeritus of the National Gallery of Art, praised Piano's command of technology and his refusal to let it command him. "His understanding of the museum's mission to put the art first has resulted in some of the most poetic and successful art museum structures anywhere," Brown observed.

Since the Pompidou project, Piano has crisscrossed the architectural map, forging an international reputation with daring commercial and public-works projects in Japan, Germany, Italy and France, and becoming renowned for designing museums that serve their collections and not the other way round.



The indefatigable, peripatetic Piano returns to the light-filled open spaces of Punta Nave, his Genoa workshop, whenever he can.

He has earned accolades for the Menil Collection museum in Houston and the Beyeler Foundation Museum near Basel, Switzerland; graced an artificial island in Japan's Osaka Bay with a dramatic terminal for Kansai Airport; and erected a strikingly graceful cultural center of soaring wood huts in Noumea, New Caledonia, where he won over the indigenous Kanaks, whose elders were deeply suspicious of Western colonial manipulation, through painstaking consultations about their customs, beliefs and aesthetic concerns.

He has designed subway stations, bridges, a prototype car, cruise ships and a ferro-cement sailboat, experimented with plant-fiber roofs in Senegal and low-cost housing in a working-class quarter of Paris. When he insisted on setting aside room for employee recreation areas in a French electronics factory, defying heated protests by management, grateful workers dubbed the spaces "Renzos."

Apart from the Sydney office tower, current projects include a major performing arts complex in Rome, a pilgrimage church in southern Italy that will have one of the longest stone arches ever built, a combination store and artisans' studio for the luxury-goods maker Hermès in Tokyo, and a proposed groundbreaking new museum for Harvard University. Just recently, the architect was asked to design a major addition for the Art Institute of Chicago.

Piano is also overseeing one of the most politically and symbolically charged building ventures in postwar European history. Berlin's Potsdamer Platz, the largest urban construction project in Europe, is rising within sight of the former Berlin Wall and the Reichstag, the recently renovated and rededicated German parliament building. Spanning an area the size of 100 football fields on the once-deadly no-man's-land dividing East from West, this high-rise complex of offices, residences, shops, theaters, cinemas and a casino is intended to recapture the prewar vibrancy of the city's central district.

With workshops in Paris and Genoa and smaller quarters in Berlin, the 100-person staff of Piano's architectural firm stays in a permanent fever of activity, juggling a dozen world-class projects at any one time. Piano himself caroms across the globe as if it were a pool table. I recently tagged along in his wake from Genoa to Berlin to Paris, my tongue hanging out.

My whirlwind odyssey around planet Piano started in Punta Nave, the architect's workshop in Genoa and a spectacular advertisement for his ideals of lightness, transparency and the vibration of light on surfaces—immaterial elements that Piano believes are as important as glass and steel for the poetic continuity of his buildings.

An airy construction of glass walls, glass roof and laminated wood supports, Punta Nave looks somewhat like a sleek ship come to rest 150 feet up on the steep, terraced hill-

An airy construction of glass walls, glass roof and laminated wood supports, Punta Nave is a spectacular advertisement for the architect's ideals of lightness, transparency and the vibration of light on surfaces.

side. Ascending to the workshop is an antic escapade out of Jules Verne. From the bottom of the hillside, a glass-enclosed elevator fitted out with director's chairs glides along slanting rails, whisking visitors past close-clipped lawns, olive and cypress trees, a stand of bamboo, wind sculptures by the Japanese artist Susumu Shingu (a favorite contributor to Piano's projects) and a 13-foot-high wooden statue from Vanuatu, a gift from the staff for the architect's 60th birthday.

Once inside, the open-plan workshop unfolds in a series of sunlit decks. It's a workplace without apparent hierarchies. Even the boss doesn't have a separate office, only a marginally larger desk table than everyone else's, tucked along one wall. Window shades and rooftop louvers are governed by photosensitive cells and operate automatically to adjust the amount of natural sunlight. If it's cloudy or dark outside, inside lights beam up to reflecting panels that produce a warmer, softer illumination than direct lamps.

Although Piano has an apartment near his offices in Paris, a small chalet in Switzerland and a sailboat moored in Sardinia, he prefers returning to Punta Nave whenever he can. "It's the hot-air balloon that allows me to look at things from above," he observes, gazing out from his corner table at the Gulf of Genoa far below.

Born about 18 miles south of his current workshop, Piano developed an early and abiding attachment to the sea, the harbor and ships—passions that are reflected today in his work and in his choice of projects. His father, grandfather, uncles and elder brother Ermanno, who died in 1991, were all builders. As a boy, Renzo loved clambering over construction sites, marveling at the magical transformation of a pile of sand and stone into a house or a bridge. Spending so much time around builders, he absorbed a deep-seated respect for craftsmanship and materials.

When Renzo told his father he wanted to become an architect, the elder Piano, a man as taciturn as his son is exuberant, took a puff on his pipe and asked, Why would you want to be an architect when you can become a builder? "In his opinion, being an architect was a good deal less worthy," muses Piano, who nonetheless followed his own road.

After earning his architecture degree from Milan Polytechnic in 1964, Piano launched his rolling-stone career pattern, working in the offices of Louis I. Kahn in Philadelphia and Z. S. Makowsky in London and founding his own fledgling studio in Genoa, where he plunged into experimental designs, turning out a mobile factory for extracting sulfur, exposition spaces for traveling pavilions, and a modular hospital. Although Piano was influenced by the work of Pierluigi Nervi, Jean Prouvé, Buckminster Fuller and Kahn, he set his maverick course from the outset, concentrating on open-plan designs and natural lighting effects—themes that have persisted throughout his career.

During two days at Punta Nave, I sit in on several no-holds-barred meetings with clients from Sydney, Stockholm and Paris, and chat with a dozen clients and staff members. It is an eye-opening introduction to Piano's feistily cooperative approach and his shamelessly hands-on style.

Meeting with the Sydney clients, the architect agilely hunkers down on hands and knees to execute a rapid sketch of

FREGOSO & BASALTO/RENZO PIANO BUILDING WORKSHOP

Floodlit at night, the massive concrete San Nicola Stadium in Bari, Italy, built for the 1992 World Cup, resembles a giant spaceship.

tree placements directly on the office tower's architectural plans. When Piano is on a roll, drawings, wooden scale models, steel and plastic prototypes—anything with a surface—are all fair game for his doodles.

"Make them light, transparent trees, like birches," he suggests. "Don't put in evergreens, whatever you do. If they're massive trees to stop the wind, then my God, you block the light. It comes down to the same old problem. You take care of the design, but you lose the man. You solve the technical problems, but you turn away the people you want to attract into the space."

Upstairs, after the Sydney meeting breaks up, a table is laid for a working lunch with clients from Hermès. Bottles of wine and sparkling water, and baskets of bread, are spread out on the white tablecloth. Arriving by the funicular-like elevator, a small brigade of caterers hauls up trays of veal, fish, pasta, eggplant, salad, cheese and tiramisu.

For the epicurean Piano, working hard doesn't exclude enjoying oneself. Even with 60 staff in Paris and 40 in Punta Nave, coming from a number of different countries, the firm maintains the camaraderie of a Renaissance guild.

Piano inspires intense loyalty among his staff. Some, like the Japanese-born Shunji Ishida, have been with him almost 30 years. Over lunch, I speak with Ishida about why he has stayed so long. "Even though Renzo likes to control things quite a lot, he always manages to teach me something new about enjoying the process of designing," Ishida reflects. "From the outset of every project, he keeps in mind the global vision and the nuts and bolts at the same time." Piano is, in fact, a meticulous craftsman, insisting that door handles, steel joints and other building details be designed within the workshop.

Ishida and Piano had recently returned from a trip to Harvard, where they had tramped around the site of the proposed new museum along the banks of the Charles River. At this preliminary stage in the design process, Piano was mulling over the conundrum of accommodating and welcoming museum crowds while maintaining the contemplative nature of the exhibitions.

"The mixing of sacred and profane has happily contaminated museums, but sometimes it gets to be too much," he explains back at his desk after lunch. "For popular exhibitions, you can't even see the art for all the people around it."

Piano's novel proposal for the new Harvard museum involves placing what he calls the profane (shops, library, restaurant and conference rooms) on the ground level, while positioning the sacred (the exhibition spaces themselves) upstairs in a sort of gigantic flying-saucer dish, camouflaged amid the trees.

"On the ground level, you buy a T-shirt—why not?—or have a coffee, attend a conference or listen to a concert. It's more convivial, more about exchange. Then comes the moment when you take your shoes off, metaphorically at least, and you go up into the place for art, for the sacred. Here, the speed changes, the space becomes more silent, the atmosphere more refined. The ground floor is extroverted, it's about communication. Then you go up and you become introverted, just talking to yourself, just wandering around."

Three weeks later, I catch up with Piano in Berlin at Potsdamer Platz. He is in "extroverted" mode, racing to put the finishing touches on the project before the official opening in October 1998, only three months away. It is 10 o'clock at night and Piano is squinting into the spotlights above the Marlene Dietrich Platz, a cinema-theater-casino complex in

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The polycarbonate plastic pyramid that Piano had lugged into IBM's Paris offices looked far too fragile to serve as the fundamental building block for the company's new traveling exhibition pavilion.

the heart of the development. He is bouncing ideas off his longtime colleague Bernard Plattner, the supervising project architect, about how to cut down the glare.

"Being blinded by one spotlight is already too much," Piano complains, puffing on his ever-present Italian cheroot. "But ten! Bernard, my friend, what are we going to do?"

"It's the same problem we had more than 20 years ago with the Pompidou Center," Plattner reminds his boss, less than reassuringly. "The authorities insist on a certain level of illumination, full stop."

"Well then, why don't we put up a series of light poles around the square like we did in Paris," Piano suggests.

"The trouble is that this square is much smaller than the one at the Pompidou," objects Plattner. "If you put up enough light poles to light the space, you risk making it look like it's being fenced off."

"You're right," says Piano, shaking his head. "I'm stumped. Let's come back in the morning and see what we can come up with." (Eventually, a limited number of streetlights are installed and a handful of unobtrusive spotlights are discreetly tucked into the theater's projecting roof.)

With that, Piano bounds away to have a look inside the theater-in-progress. There's a gaping hole in the floor, scaffolding everywhere and exactly two rows of red plush seats, but Piano is as fired up as a kid on Christmas Day.

"We will be ready, won't we?" he asks Plattner somewhat anxiously. "We better be. The owners have already guaranteed bookings. Right here, in fact, is where the next Berlin Film Festival will take place. Imagine that," continues Piano, plopping down in the lonesome seats as if the curtain is about to go up.

After this brisk inspection, Piano sprints back outside, where he launches into a description of the moon image he's conjured up to project onto the giant globe of the IMAX theater overlooking the plaza.

"People will think a meteorite has crashed into the building," Plattner chimes in, obviously still amused by the nuttiness of the idea. After more than 20 years of working with Piano, Plattner has become a dedicated convert to his boss's taste for playful shock effects.

"Renzo is like a long-distance runner, but one who is always a bit ahead of you," Plattner tells me later as we tour the emerging shopping mall. "He keeps you constantly out of breath."

Does he always keep up this pace? I ask Piano the next day, when we are momentarily at rest inside his office. Surveying the sea of cranes and scaffolding outside, he laughs. "I love to work the way I work," he says. "Going around onsite, touching things, coming back, sketching, screwing in things and unscrewing them. Bigger firms do not work this way, but I think I will never change."

When I ask him to describe his work process, Piano does not miss a beat. "Have a look," he says, as he hauls out his overnight bag and pulls everything out onto the table as if for a customs check. In addition to an extra shirt, a rarely worn tie, a toiletries bag and a copy of Italo Calvino's *Invisible Cities*, are six or seven dossiers of projects in various stages of progress. Everywhere he goes, even sailing in the Mediterranean, he carries a number of these dossiers with him. Crammed with initial sketches, notes, postcards and photographs, the files grow ever larger as the projects go forward.

"Every day you have to keep in mind where you have started from and where you want to go; otherwise you lose direction. It's a constant gymnastic between the day-to-day

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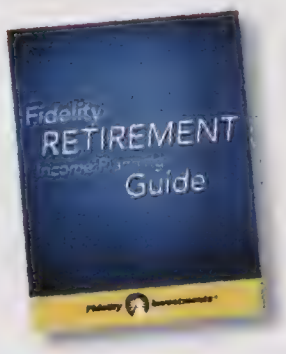

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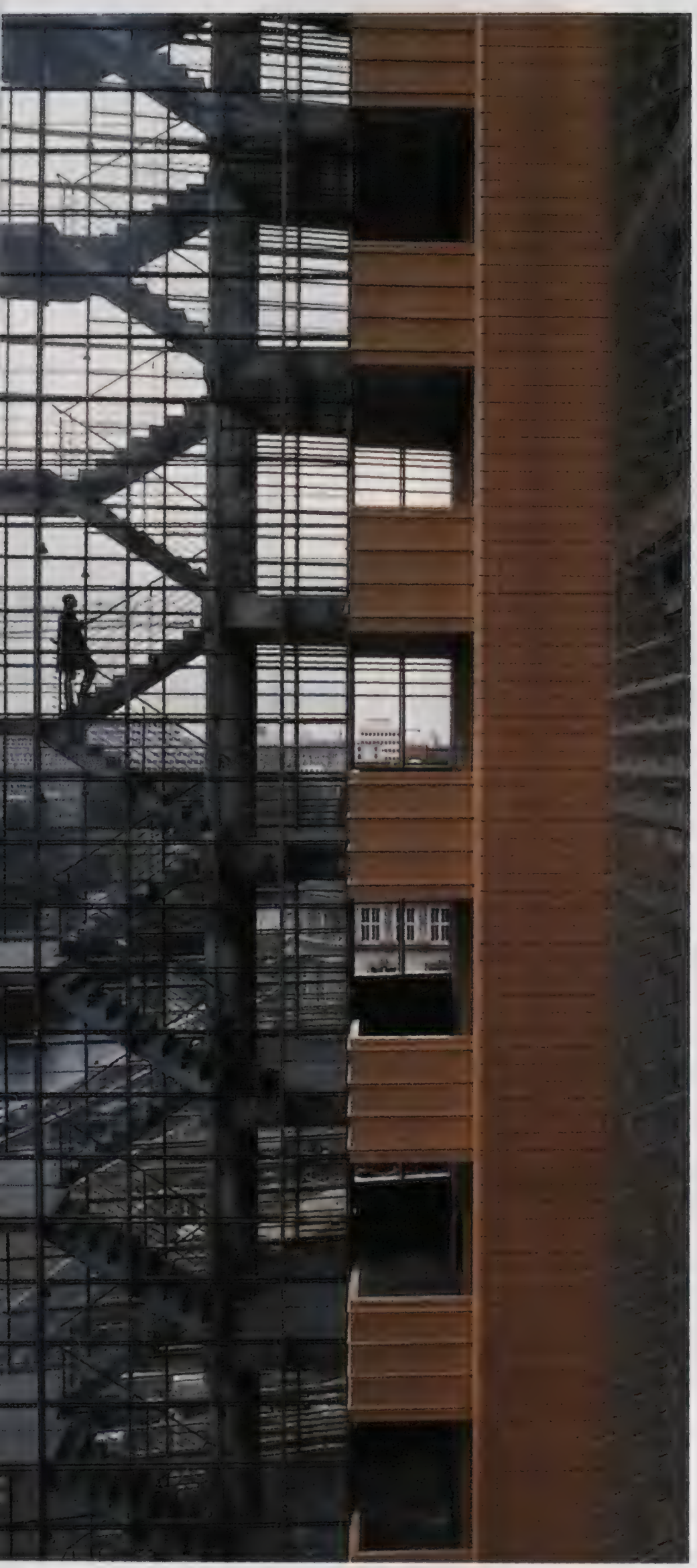

The Debis company's glass and terra-cotta office tower in Berlin's Potsdamer Platz artfully blends transparent and opaque elements.

life and this," he says, tapping the dossiers. "This is the course. That's why I don't mind moving around so much. By getting away from a place, you let the mind slow down and refocus. Eventually, you see things clearly that you had missed completely."

If Punta Nave is Piano's hot-air balloon, far above the hurly-burly, then the Paris workshop is the mother ship, in the midst of the cafés, galleries and chic clothing stores of the Marais, almost in sight of the Pompidou Center. From an open-plan office inside a converted 18th-century townhouse, its two levels lit by a massive skylight, Piano's staff navigates through projects from Lyons to Sydney. Every inch of wall space is covered with sketches, photographs and drawings of projects in various stages of completion—object lessons in the staggering diversity of Piano's output.

Looking at the drawings, I recall an article I had read by Peter Buchanan, the author of an exhaustive, three-volume survey of Piano's career. "A great Piano virtue is that there is no such thing as a typical Piano building," Buchanan observed. Unlike Frank Gehry, Richard Meier, Frank Lloyd Wright or Le Corbusier, all architects with an instantly recognizable stamp that runs throughout all their works, Piano's signature is that there is no signature. That said, it's clear that one theme underlying all of Piano's designs is lightness.

"Anyone can build using a lot of material," Piano explains in *The Renzo Piano Logbook*, an engrossing layman's survey of the architect's career. "Taking weight away from things, however, teaches you to make the shape of structures do the work." The Tjibaou Cultural Center in New Caledonia, based on indigenous hut design, is a perfect example. Leading me downstairs, past rows of architects at their computers, Piano and Paul Vincent, a longtime associate heading up the project, usher me into a conference room to inspect a model of the center. It is an unlikely array of what look to be truncated barrels made of wooden lattices and spines, some more than 90 feet high in the actual construction. Frankly, they don't look as if they could withstand South Pacific typhoons, and originally, they couldn't.

As Vincent explains, the early prototypes of the twin-layered conical huts ignominiously collapsed in wind-tunnel tests. Piano then came up with the elegant solution of making the slender spines hexagonal instead of square. That simple structural adjustment did the trick, strengthening the lightweight iroko wood enough to withstand typhoon-strength winds of 155 miles per hour.

Throughout his career, Piano has experimented with techniques that make use of wood, stone, glass, terra-cotta and other traditional building materials in thoroughly modern and unexpected ways. In the room next to the New Caledonia project, the two architects show me a model of the Cité Internationale, a sprawling residential and office com-

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A 38-story office tower for Sydney, Australia, will be enveloped by a massive translucent "sail," a dramatically innovative design that has the dual purpose of capturing sea breezes off the harbor and echoing the sail-like roof of the city's opera house.

plex with a museum, cinema, hotel and casino for the French city of Lyons. The entire project is covered with glass, and terra-cotta the color of burnt umber, in what Piano terms the "double skin" facade, a striking innovation that he has also adapted for Berlin and Sydney. Although other architects have employed the technology, the double-skin facade has become a Piano trademark.

Piano and Vincent explain that the original notion was inspired by greenhouse construction. In the double-skin design, an external layer of louvered glass panels is placed at a distance—generally about 30 inches—from terra-cotta cladding and interior windows. This breathing space facilitates heating and cooling. People inside the building can open windows for cooling, even in the rain, or they can close both exterior panels and interior windows, creating a layer of air warmed by the sun in the daytime.

"The glass panels also give a building interesting color vibrations that shift as sunlight and cloud shadows move across the surface," Piano observes.

Like the double skin of the greenhouse and the Kanak huts, Piano's inspirations come from anywhere and everywhere. "The geography, topography and history of a place are all very important sources for ideas," he explains back upstairs in his Paris office. (Unlike Punta Nave, this one has a door, even though it's invariably open.) "In Berlin, all the historical references had been wiped away, so we drew on the plentiful mythology of the site. For New Caledonia, we hired an ethnologist to give us a crash course in Kanak customs and beliefs. Sure, you can sit down and have a great idea, but wait a second—before doing that, first you have to dig in the quarry."

Because Piano is so down-to-earth and wary of theorizing, he is a formidable source of inspiration, not just for his staff and clients, but for the general public forced to live with the reality of architects' dreams for better or—too often—for worse. As he reminded his White House audience during the Pritzker ceremony: "You can put down a bad book; you can avoid listening to bad music; but you cannot miss the ugly tower block opposite your house.

"I was 7 years old in 1945, when the miracle of postwar reconstruction began," he continued. "In the name of progress and modernity, a lot of stupid things have been said and done. But for my generation, the word 'progress' really meant something. Every year that went by took us further from the horrors of war. . . . I belong to a generation of people who have maintained an experimental approach throughout their life, exploring different fields, ignoring boundaries between disciplines, reshuffling the cards, taking risks and making mistakes. . . . But at the same time, you love your past (as an Italian, or, rather, European, you have no choice). And so you live in a limbo between gratitude towards the past and a great passion for experimentation, for exploration of the future.

"So we beat on," he concluded, quoting Fitzgerald's narrator in *The Great Gatsby*, "boats against the current, borne back ceaselessly into the past."

Yes, indeed, but bringing us bravely into the future, if Piano and his particular blend of Renaissance and 21st-century workshops have anything to do with it.

Author Richard Covington writes about the arts and other cultural subjects from his home near Paris.

PHOTO/RENZO PIANO BUILDING WORKSHOP

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40	$ 148	$ 183	$ 185	$ 263	$ 273
45	$ 200	$ 210	$ 265	$ 360	$ 393
50	$ 260	$ 305	$ 375	$ 535	$ 590
55	$ 380	$ 428	$ 578	$ 1,018	$ 1,065
60	$ 528	$ 675	$ 865	$ 3,140	$ 3,140
65	$ 838	$ 993	$1,633	$ 4,100	$ 4,100
70	$1,400	$ 1,637	$3,283	$ 5,270	$ 7,220
75	$2,797	$ 4,770	$6,560	$10,370	$10,370

Male Premiums

Age	10 YEAR	15 YEAR	20 YEAR	25 YEAR	30 YEAR
35	$ 138	$ 153	$ 178	$ 245	$ 273
40	$ 161	$ 199	$ 243	$ 345	$ 360
45	$ 240	$ 315	$ 375	$ 500	$ 523
50	$ 358	$ 483	$ 558	$ 798	$ 838
55	$ 535	$ 720	$ 848	$ 1,640	$ 2,810
60	$ 860	$ 1,070	$1,353	$ 4,100	$ 4,100
65	$1,453	$ 1,813	$2,850	$ 5,270	$ 5,270
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The Peaceful Primates

Costa Rica's squirrel monkeys are adorable, charismatic, sexy and critically endangered

BY CHARLES BERGMAN

FEW MOMENTS IN THE FOREST COMpare with the thrill of hearing a troop of squirrel monkeys approaching through the trees. There is the subtlest hint of their arrival, a peep perhaps, barely distinguishable from the calls of forest birds. Suddenly, branches are breaking and trees come alive. With a feeling of sweet anticipation, such as precedes all good arrivals, I realize the monkeys are coming.

The squirrel monkeys of Costa Rica bring a special delight for my forest guide, Sue Boinski, a professor of anthropology and comparative medicine at the University of Florida. She has spent the past 20 years studying squirrel monkeys in Central and South America. I watched her face grow animated as we heard them coming. Though spectacularly colored, they are surprisingly invisible and fade into the foliage.

Using its long tail for balance, a squirrel monkey leaps across the forest canopy.

"But once you find them," Boinski laughed, "squirrel monkeys on the move are about as subtle as a high school marching band."

It was easy to see why she is so attracted to them. These small (weighing about one and a half pounds), adorable and charismatic creatures are becoming an important symbol for wildlife in Costa Rica, and their unusual social behavior makes them remarkable primates.

Boinski and I were in Manuel Antonio National Park near the old fishing village of Quepos, Costa Rica, where she had returned to gather more data on the behavior of squirrel monkeys during mating season and to collect DNA material. Her work is urgent because this species, *Saimiri oerstedii*, is critically endangered. As the monkeys worked their way toward us, they grabbed small red fruits called *guayabón*, a type of wild guava. Scampering dexterously across small branches, a band of juveniles saw us and came closer. One youngster swung onto a curving vine, stretched out his body and plucked a huge grasshopper from bromeliads on a nearby tree trunk. Another skipped across a thin branch just a few feet away, plopped down in front of us and looked us straight in the eye. As surely as we were studying him, he seemed to be studying us.

Though squirrel monkeys are increasingly rare, such encounters with them in Costa Rica are not unusual. Troops often approach tourists in this popular resort area. They are inquisitive and friendly, and their golden beauty makes them everyone's favorite.

Of the four species of primates in Costa Rica, the squirrel monkey is certainly the most beautiful. It's also, well, "squirrelly," with its rapid movements and flowing tail, which it wraps around itself for warmth as it naps in the trees. The creature's most striking feature, though, is the vibrant pumpkin-orange fur on its back. Its face is dramatic, too, topped by a black or gray cap with a widow's peak that frames white fur, pink skin and huge eyes. A splotch of black skin covers its mouth like face paint, accentuating its expressiveness.

In Central America, the squirrel monkey is confined to small pockets dispersed over the southern half of the Pacific coastline. Manuel Antonio National Park and the area around it marks its northernmost boundary. A closely related subspecies occurs farther south, in Corcovado National Park. There was once a population in Panama, but it has disappeared as the forests have been decimated. (Tiny relict populations have recently been discovered near the Costa Rican border.) Squirrel monkeys are lowland creatures who thrive in the tropical forests, where they forage for soft fruits and juicy bugs. The troop of

GREGORY G. DIMIJIAN/PHOTO RESEARCHERS

monkeys Boinski and I were observing lives in the forest adjacent to one of the park's most spectacular beaches.

The area's beauty makes Manuel Antonio one of the most popular national parks in Costa Rica. This fertile part of the country is also desirable for agribusiness, particularly for raising bananas and palm oil trees.

Tourism and farming have negatively affected Coast Rica's fragile and isolated population of squirrel monkeys. The creatures are separated from squirrel monkey species in South America by about 600 miles, and how they got here has been a matter of speculation and controversy. Their isolation has made them vulnerable, and in recent decades their numbers have crashed dramatically. All of Costa Rica's squirrel monkeys are endangered, but the subspecies around Manuel Antonio (*Saimiri oerstedii citrinellus*) is nearly gone. Fewer than 1,000 monkeys survive from a population that Boinski estimates was about 5,000 some 30 years ago.

"Without intervention they are most certainly drifting toward extinction," she said. "Deforestation is the major problem. The answer is to buy land, protect it and manage it to maintain second-growth forest." Squirrel monkeys prefer second-growth forests because of the plentiful supply of their favorite insects and fruits.

The friendliness of the monkeys as they swirled close about us in the trees gave me a hint of their remarkable behavioral adaptations. Due to their geographic isolation, the monkeys have evolved in unique ways. They are probably the most egalitarian of the primate species that form groups consisting of large numbers of both sexes. The males show aggression so infrequently among themselves that researchers can't discern any dominance hierarchies. According to Boinski, there is no less-aggressive primate society.

One of Boinski's delightful qualities is her skill at condensing, like a good teacher, the technical language of primatology and animal behavior into colorful everyday terms. With a smile and a kind of pride in the monkeys, she said, "This is the peaceable kingdom. They are the peaceful primate." Indeed, the juvenile that had approached had seemed wonderfully calm as he peered at us.

"I think they are like the tourists who love to come here to the tropical beaches," Boinski said, smiling. "They're just hanging out, playing and looking for good food and sex."

With her bright clothes, Boinski does not have the look of a field researcher. "But I love to spend lots of time here in the jungle," she continued. "I try to be a fluent listener, and after a while, it's like the forest forgets I'm here. Then, anything can happen."

Through thousands of hours of painstaking fieldwork, Boinski has assembled data not only on the squirrel monkeys in Costa Rica but also on their near cousins in South America. She has spent up to 18 months at a stretch in the wet tropics living on rice and beans. In gathering data she documents both numbers of animals and their behaviors.

After spending several days with Boinski, I realized that her knowledge of these monkeys is so intimate that she almost sees the landscape through their eyes. She showed me this landscape as we imitated the monkeys foraging, gingerly unwrapping dead leaves of *cecropia* trees to find the wolf spiders and cockroaches that they eat. They suck ripe berries, she explained, because their jaws are too weak for hard fruits or nuts.

The monkeys just hang out, "looking for good food and sex."

PP. 78,79,81 CHARLES BERGMAN

Sue Boinski's research proves Costa Rica's squirrel monkeys are a true species.

Costa Rica's squirrel monkey (left) has a more peaceful social behavior than its South American cousin.

But the most compelling part of Boinski's studies reveals the squirrel monkeys' peaceful social behavior within their society, particularly their mating behavior, sexual relationships and birthing patterns.

One of the males in the troop we were observing suddenly stepped forward, climbed up a dead tree trunk and emerged into full view standing erect. Framed by green leaves, he turned golden in the soft light.

"Look at that beautiful boy," Boinski exclaimed. "See how huge he is!"

He looked like a squirrel monkey on steroids. Through his chest, shoulders and haunches, he had the "puffy" look typical of males during the mating period. Between July and September, the males "fatten," increasing in body size by 20 percent. This male seemed to be posing in a way that exposed his genitals. His testicles were double their normal size.

The mechanism causing the swelling is unique to this genus of primates; it is also strange. During mating season, the males convert their testosterone into estrogen, which causes them to retain water and thus gain body size. The more testosterone the males have, the more estrogen, and the bigger they swell. These engorged males look like buffed teenagers. Boinski calls them "diminutive bulked-up linebackers."

The male body size is crucial during mating. It is a characteristic of sexual selection, and the females apparently find these swollen males alluringly sexy, and the bigger the better. Boinski has documented that the largest male in the troop gets 70 to 90 percent of the matings in any given year. Since size determines who mates, males do not fight for dominance or compete for females.

In the mating season, the males "fatten," growing in size by 20 percent.

"Look at these males," Boinski said. "Several of them are just hanging around, and see how young males gather near the big ones. This behavior is rare in primates. The males like to be together. And when it comes to mating, they even help each other."

Squirrel monkeys begin courtship by genital sniffing. Generally, a group of two or three males approaches a female, mobs her, immobilizes her, and takes turns sniffing her bottom to determine if she's in estrus.

In the years Boinski has observed the monkeys, though, she has never witnessed males forcing females to copulate. Rather, ultimately, the females choose their mate. Since one of the males may have sired nearly all the babies during the year, most of the males in a troop are likely related. "All these males," Boinski said, "may be half brothers, making it even more likely that they cooperate. That's why they're so buddy-buddy."

Recognizable by their smaller size and darker black cap, the females we observed typically sat apart, solitary, and spent their time foraging. The males lounged nearby, in loose groups. Many females were still nursing their young of the year. The youngsters frolicked vigorously in a rough-and-tumble play that is the most aggressive behavior that squirrel monkeys display within the troop.

These monkeys are also remarkable among primates because they give birth the same time every year. Called "birth synchrony," their birth periods are "unusually predictable," Boinski

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A beautiful beach draws tourists to endangered squirrel monkeys' protected forest.

said. They occur over a two-month period, between early February and early April, peaking during a five-day period in mid-February. "The babies are popping out like popcorn during that single week," she laughed.

Although many monkeys have birthing peaks that correspond to food availability, the peak time of squirrel monkeys is unusually tight, Boinski explained. Such highly synchronized birthing reduces infant mortality. Most of the young born prior to the peak birth week die, and about 50 percent of all the infants die within six months of birth. The infants are especially vulnerable to predators, including hawks and falcons. Boinski has seen toucans scrape baby monkeys off their mothers' backs. The only time females associate closely with one another is when the mothers form protective alliances among themselves to watch for predators. Boinski describes this behavior as "glomming."

The female squirrel monkeys of Costa Rica also emigrate from one troop to another, again unusual among primates; in most species the males transfer. When they are about 2 years old, the females leave their natal troop to find another, where they mate with the males. The females are always accepted by the new group.

While we were watching another troop farther into the park, near a popular beach, we actually saw a collared forest falcon attack a group of monkeys. Toward dusk, the troop was moving slowly among the branches of the huge almond and *cecropia* trees to return to its sleeping tree. About 50 feet above, several monkeys stopped to rest and play on the

The monkeys suddenly dropped from the trees as if they'd been shot.

branches. The falcon, distinctive with its white belly and dark body, sliced through the canopy, cruising the troop. Suddenly, about half the group let out an earsplitting screech. It was a signal, and the monkeys reacted immediately, scattering in all directions. Several of them dropped as if they'd been shot. Others leapt into the air, scrambling for branches to grasp as they plummeted to the ground.

The tiny squirrel monkeys avoid predators by sleeping on the ends of palm tree fronds at night. Even in the heavy rains the fronds shake at the slightest movement.

When the monkeys detect an intruder, "they just let go," Boinski explained. "They fall out of the trees like apples."

When Boinski first arrived in Costa Rica, she was a 23-year-old graduate student hoping to study the foraging strategies of these monkeys. Though squirrel monkeys are the second-most common primate used in medical research in the United States (only rhesus macaques outnumber them), they had been poorly studied in the wild. All that was known was learned from the notoriously aggressive captive animals originating from the South American population, which has strong social hierarchies.

"On my first trip to Costa Rica," Boinski explained, "I set up my tent and found a troop right next to it." The monkeys came very close. To identify individuals she squirted them with black dye to mark them.

"I thought my project was going to be easy," Boinski reflected. But there was one big problem. "I wasn't seeing any aggression or hierarchies. The monkeys just weren't doing what they were supposed to do. I thought I was a failure.

MIKE YAMASHITA/WOODFIN CAMP & ASSOCIATES

"But what I did learn," she continued, "is to trust my data."

Her data helped her see the divergent evolution of the social behavior of squirrel monkeys. She observed that Costa Rica's squirrel monkeys were very different from those in South America, where most of the research animals were captured. As Boinski pieced together the social behavior of her squirrel monkey troops, she compared her data with the characteristics of two South American species, both of which are abundant.

The three species are closely related, yet each has evolved a different social structure. In the Peruvian species, *Saimiri boliviensis*, the females are dominant and very aggressive. They form alliances with female relatives to defend their food patches, and only the males emigrate to other troops. A second South American species, *Saimiri sciureus*, is found from Suriname down to Brazil. The males are dominant, and both sexes are aggressive and fight each other ferociously. Both species differ greatly from Costa Rica's nonhierarchical and gender-equal squirrel monkey.

"There is no other primate genus in the world in which three separate species are so similar morphologically in body size, shape and diet specializations," Boinski says, "yet display such divergent social adaptations."

When she looks at these monkeys, Boinski sees evolution in action. Her current studies focus on understanding why these species, so closely related, are so different socially.

What is becoming clear to her is that the social organization of primates, especially in regard to gender, is more complex than we know. Past theory has focused on tight male bonds and male aggression, but these three species of squirrel monkeys suggest that there are alternate social strategies within and among species.

Another aspect of Boinski's study is the molecular variation among the species of squirrel monkeys. Scientists debate how Costa Rica's monkeys came to Central America, from South America. One theory suggests that several species came north with pre-Columbian traders no earlier than 30,000 years ago. If so, the squirrel monkeys in Costa Rica are not a true species but a hybrid population.

DNA studies indicate monkeys came to Costa Rica millions of years ago.

Boinski believes she has proved this theory wrong. Not only does squirrel monkey behavior argue against it but so does DNA. She and another researcher, Susan Cropp, at the University of Chicago, have conducted studies with DNA, comparing the three species. The results are just being published.

They have demonstrated a distinction between the species on a molecular genetic level, as well as on a behavioral level. The monkeys in Costa Rica were not introduced by humans. The DNA analysis indicates they came there perhaps millions of years ago and have been evolving separately ever since.

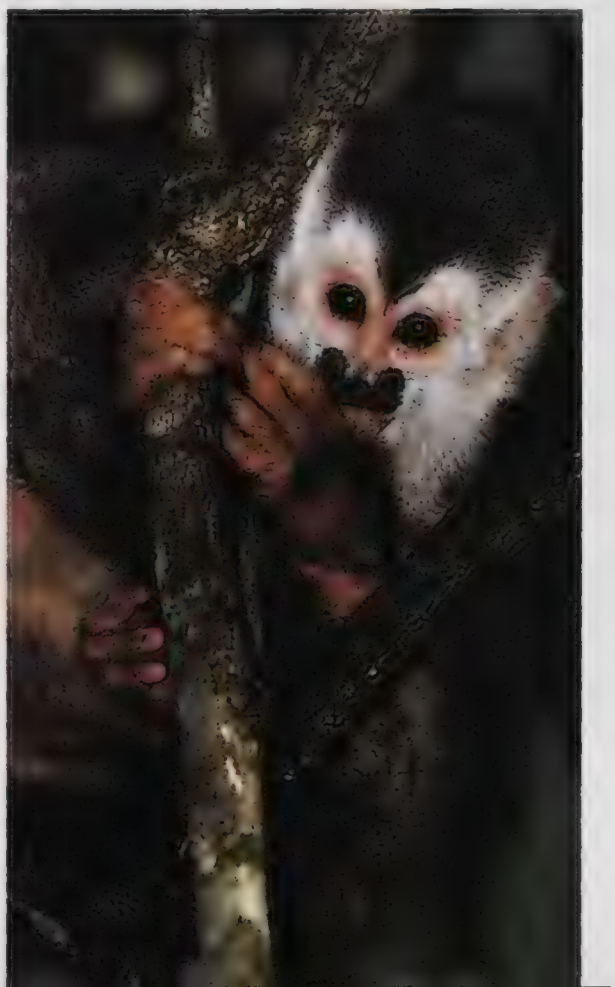
Doubt as to whether the Central American squirrel monkey is a true species has hindered conservation efforts; the government is reluctant to commit funding to protect a nonnative hybrid. With Boinski's new genetic research giving solid evidence of the species' authenticity, she expects to see more interest in conservation.

Boinski and I visited Jardín Gaia, a private animal rescue center near Manuel Antonio. Dario Castelfranco, who founded and runs the shelter, is a vigorous political advocate for squirrel monkeys. His major concern is that the habitat for the monkeys is dangerously fragmented, and at only 2½ square miles, Manuel Antonio National Park is much too small to harbor more than the three troops that live there—about 100 monkeys in all.

The rest must live in unprotected and increasingly developed habitat on the periphery of the park, where the monocultures of agribusiness are filled with pesticides, and there is little food.

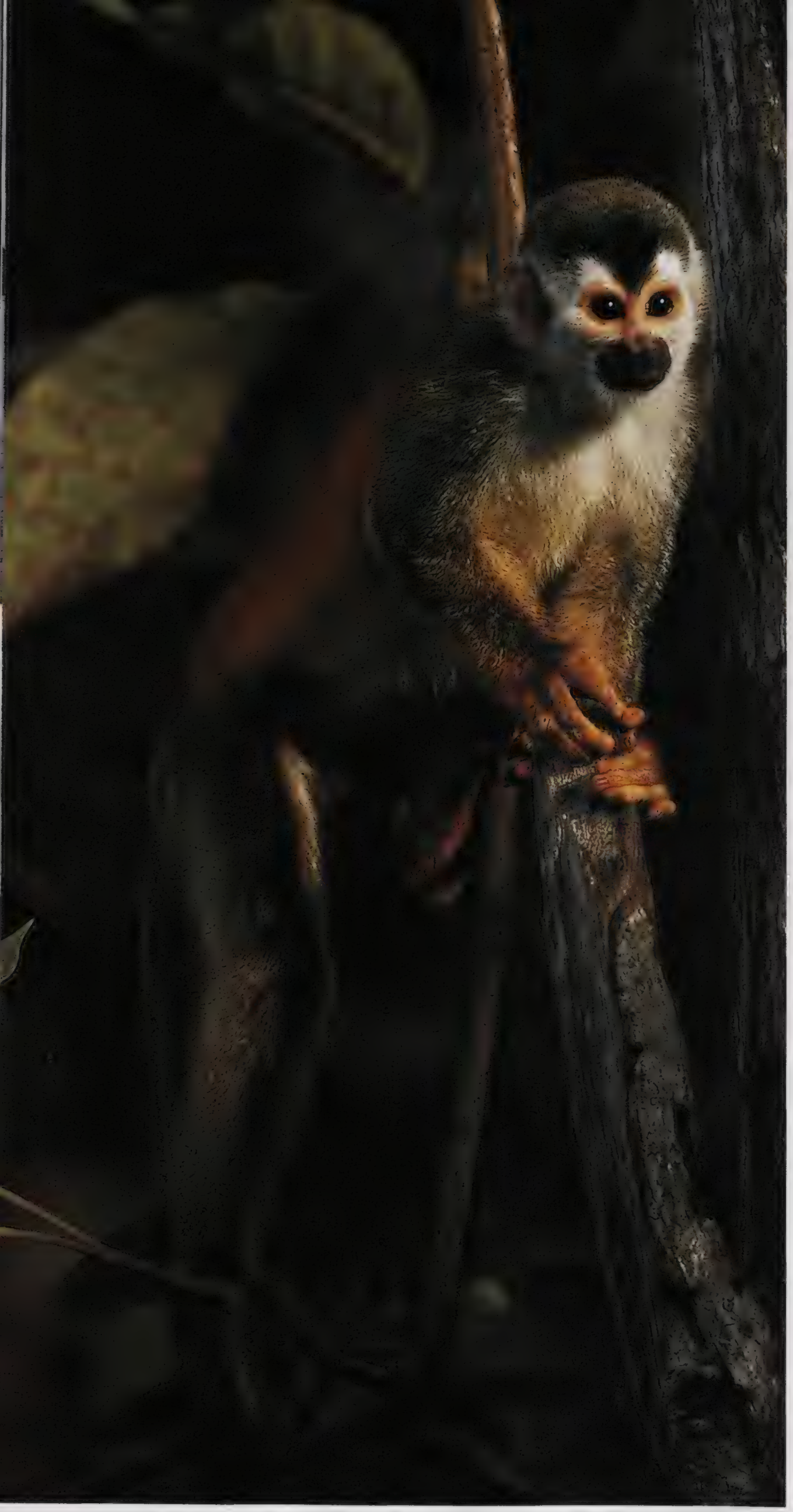
During our visit with Castelfranco, the body of an old male squirrel monkey was brought in for an autopsy. The animal had been electrocuted on the power lines that primarily support tourist and agricultural development in the region. It's a common cause of death for squirrel monkeys, who use the wires to cross the roads that dissect their territories.

A passionate and feisty Italian, Castelfranco is a one-man conservation force. "I used to be an idealist," he said. "I didn't see how we could lose. We have all the arguments. It's a flagship species, a wonderful animal. So cu-u-u-u-te, and they eat insects, so farmers like them."



CHARLES BERGMAN

A young squirrel monkey sucks its thumb while hanging onto a liana vine.



An adept hunter, a squirrel monkey scans its surroundings for camouflaged insects.

But the monkeys themselves may unwittingly contribute to the difficulty in convincing people they need protection. Their friendly nature brings them face-to-face with tourists in local hotels and restaurants. The resort owners know what an attraction these monkeys are, so they feed them bananas to lure them.

"Squirrel monkeys would sell their tails for a banana," Boinski said.

One evening, we went to a restaurant that feeds the monkeys. Their arrival was quite different from the one we experienced our first morning in the forest. At the restaurant, we could set our watches by their entrance at dinnertime. They are completely habituated to strangers. The monkeys climbed onto the open-air railings, scampered across tile floors and sneaked onto dinner tables. One monkey, looking for a banana, strutted up on his hind legs to some patrons who were drinking beer.

The tourists squealed with delight. The monkeys squealed, too. The scene was full of energy and emotion. "I want to kiss one," a woman screeched. "I want to take one home with me," a man offered. "I bet I could get a thousand bucks for one," another man joked.

The scene confirmed Boinski's point. The monkeys appear so abundant that it is difficult to convince anyone, locals or tourists, that these creatures are extremely endangered.

Swollen and swaggering macho-style, one of the largest males leapt onto the railing and loaded up with banana handouts. With his mouth stuffed, he scurried off with all he could carry. Perhaps the bananas are harmless, but we need to offer these peaceful and pleasing monkeys something more—help to survive.

Charles Bergman teaches at Pacific Lutheran University in Washington and last wrote for SMITHSONIAN *about Hawaii's monk seals.*

CHARLES BERGMAN

Here are the keys to Steve Brown's success.

As a teacher and musician, Steve Brown wanted his special needs students to experience the joy of playing an instrument. But sheet music written specially for those with learning disabilities didn't exist.

So Steve Brown developed his own music curriculum using a letter system, instead of notes, which allows learning-impaired students to play keyboard compositions for the first time.

Mr. Brown's musical instruction, in turn, has created the most eagerly anticipated event of the school year—the annual recital. Performing for parents and fellow students improves his kids' self-esteem and confidence by demonstrating just how much they can achieve.

For bringing the magic of music to his students, State Farm is pleased to present Steve Brown with our Good Neighbor Award and to donate a total of $5,000 to the Jefferson School library in Johnston City, Illinois and the local chapter of the Council for Exceptional Children. He's proving there is nothing as uplifting as a simple melody.

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Good Neighbor Award

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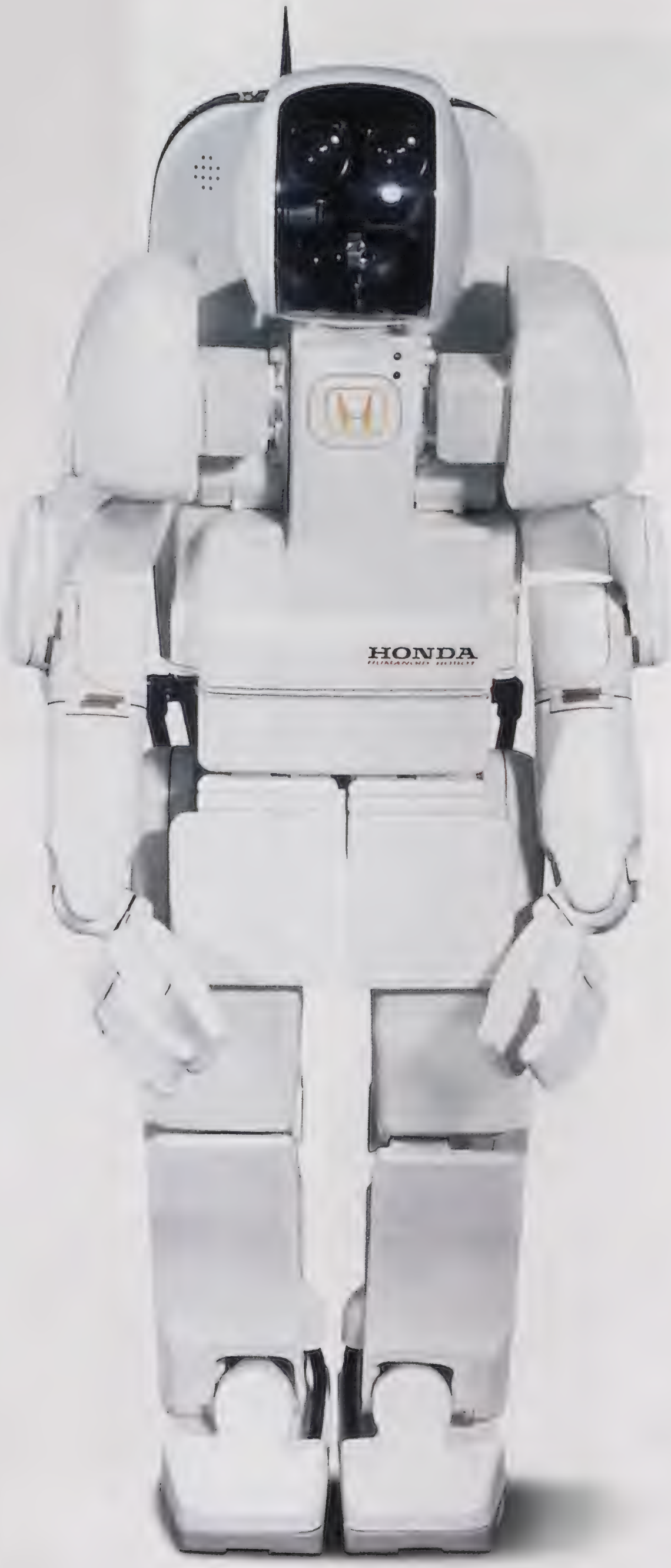
The Good Neighbor Award was developed in cooperation with The Council for Exceptional Children.



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His great grandfather was a Honda Civic.

Is it possible for a robot to inherit power? Intelligence? Style? Assuming the robot is the revolutionary new Honda P3, the answer is "yes." After all, he comes from a long line of Honda products with those traits.

With a design based on extensive study of human motion, P3 walks, climbs stairs and turns corners with ease. He carries loads. He pushes carts. He makes U-turns. All while maintaining a remarkable sense of balance.

P3 is merely one example of the innovative thinking taking place at Honda. We're also hard at work on technology for solar cars, jet engines and community-shared vehicles.

Ideas that, like P3, are designed to work in harmony with humans. And, ultimately, to help create a new dimension in mobility. Seems P3 is exactly like his great grandfather, after all.

HONDA
Thinking.

high & dry

BY JIM DOHERTY

ON THE LOOSE IN THE PUNISHING TERRAIN OF THE GRAND STAIRCASE-ESCALANTE NATIONAL MONUMENT

PHOTOGRAPHS BY DAVID MUENCH & TOM TILL

Carved by the wind, an arch in southern Utah frames the Kaiparowits Plateau.

ANYONE WHO HAS SPENT MUCH TIME RECREATING IN THE WILD KNOWS THERE ARE A NUMber of discomforts with which the human organism can cope—biting insects, cold, hunger. Then there's thirst. There is no coping with thirst. If you are thirsty, you do not say, "Oh, well—maybe we'll find water tomorrow." Forget tomorrow. Thirst does not mess around. Either you drink or your engine light goes on and you start acting stupid. Your muscles cramp, you hallucinate, your throat dries out. In a worst-case scenario, you can expire.

My backpacking partner and I got a taste of this, so to speak, as we made our way out of a blistering desert wash in southern Utah one afternoon last fall. The day before, we had stopped off in Escalante (pop. 900) for supplies and advice. Beautiful downtown Escalante consists of a few restaurants, a handful of motels, an outfitter and a grocery store. Sneeze while you drive by and you'll miss it.

The same cannot be said, however, for the country Escalante is in. On one side, the fabulous jumble of mountains, streams and grasslands known as the Aquarius Plateau heaves its immense bulk to elevations well over 10,000 feet. On the other side, sprawling clear down to Arizona more than 50 miles away, reposes one of the most formidable chunks of intact wilderness left in the continental United States, the tortured topography of escarpments and high-desert canyon lands now known as the Grand Staircase-Escalante National Monument. That was our destination.

Until President Bill Clinton conferred monument status on the 1.7-million-acre area in 1996, most people had never heard of it. But even before the Grand Staircase-Escalante became famous, the region it occupies and the several ranching communities that stick to it like ticks had begun to change in ways familiar throughout the West—tourism, new homes, vacation getaways, the works. I figured if I was ever going to see the place while it was still a genuine remnant of the old frontier, I'd better get at it before Wal-Mart and Howard Johnson moved next door.

People in Escalante confirmed that the part of the monument we were thinking about exploring over the next few days, a wash near Big Horn canyon ten miles south of town, did indeed meet the criteria we stipulated. It had been visited by a contingent of John Wesley Powell's second Colorado River expedition, whose overland route we were retracing; it was scenic, and it had plenty of water.

They were right about scenic. Each time we rounded a bend, some new astonishment brought us to a gaping halt: soaring Navajo sandstone, towering hoodoos, ornate minarets, fantastic side canyons and brilliant banks of yellow and purple wildflowers. They were wrong about water. The meager rivulet we stepped across when we started out expired soon thereafter. The clay of the wash was so cracked and curled it felt like we were walking over shards of broken pottery. We saw no springs; there were no creeks, no seeps.

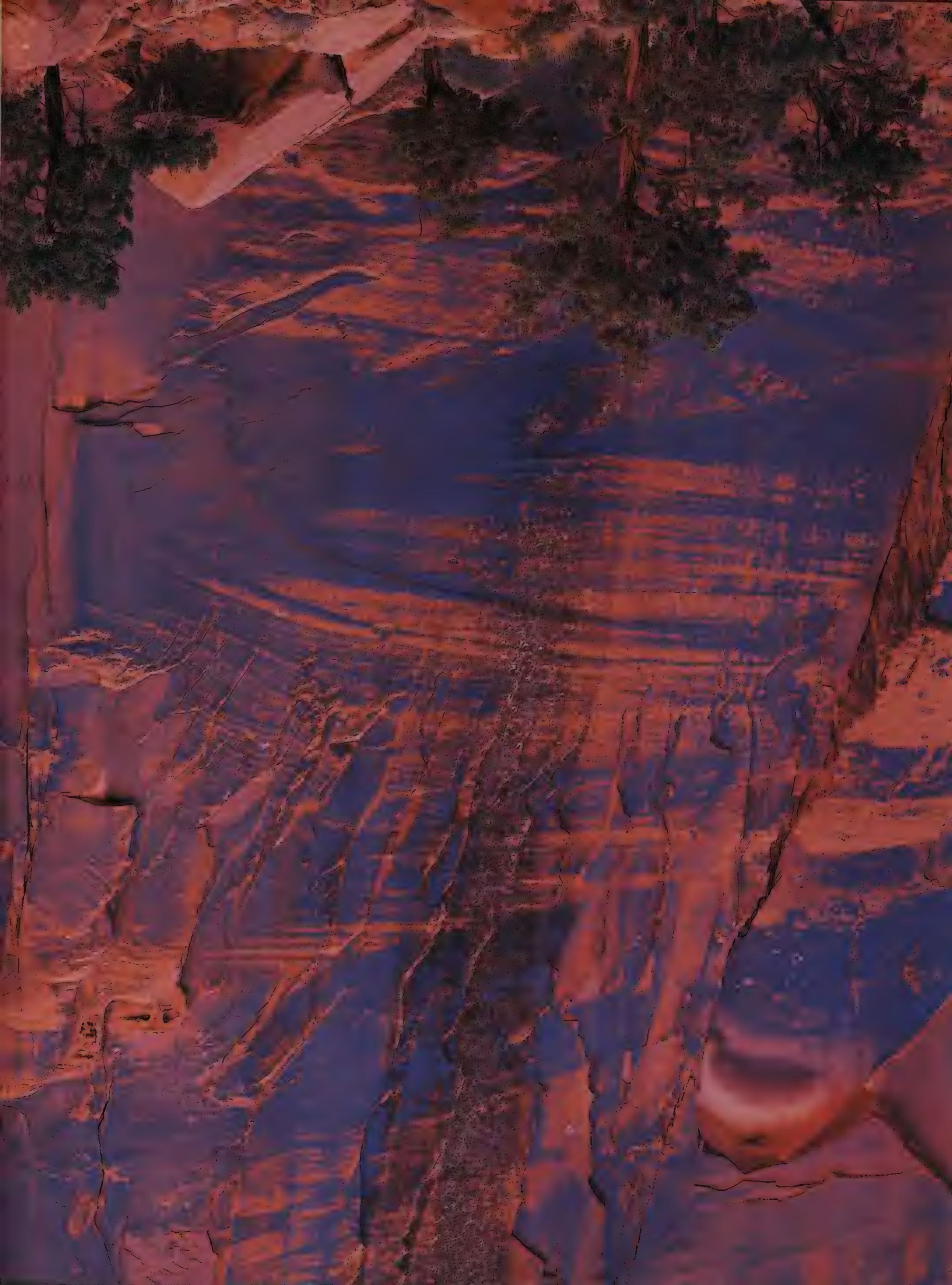
By the time I realized the fix we were in, the water we had brought with us was half gone. At that point, we had no choice but to make camp and turn back the next morning. While we were unpacking, the sun went down and the air cooled noticeably. The towers and bluffs to the east were glowing with a fierce incandescence. Beyond them, somewhere up ahead, the Escalante River snaked through a maze of buttes and canyons on its way to the Colorado. It was very quiet. Nothing moved until a falcon dropped out of the sky like a sickle blade and tucked into a nearby cliffside. Coming in we had seen lizards, jackrabbits, enormous beetles. Early on we had encountered cattle, and all day we kept coming across their trails. Now we were far from livestock, far from civilization.

We built a small blaze atop a fire pan I made by stacking several flat rocks. We could tell from the smoke—it smelled like incense—that the dry wood we had gathered was mostly piñon and juniper. We enjoyed some wine, wolfed down a sandwich and watched needles of light prick tiny holes in the darkening sky. It was great fun—but not easy to resist taking a long pull on the old canteen.

The sun was up before we got under way in the morning. A few hours later, I heard a strange croaking sound. It was me. I was trying to say, "Slow down," but all that came out was *croak*. We had run out of water and were drenched in sweat. Her calf muscles and hands were cramping up. I was daydreaming about glasses of lemonade . . . 32-ounce Big Gulps . . . Niagara Falls . . . Antarctica. As we inched along, a suitable working title for the posthumous movie that would be based on our unfortu-

Bizarre sandstone pinnacles glow at sundown amidst the sparse grass and scrawny piñon of Escalante Canyon country.

DAVID MUENCH; PP. 90,91 TOM TILL



nate little excursion flashed before my eyes: "Two Dopes From the East Learn About the West the Hard Way."

Not that there's an easy way. We were, after all, in the heart of the Colorado Plateau, a notoriously arid territory that owes its rugged contours mainly to erosion, of all things. The monument itself is made up of three different sections. It was the geologist Clarence Dutton who coined the term "Grand Staircase" for the western section, an ascending series of cliffs and plateaus. The canyons associated with the Escalante River make up the eastern section. The wedge-shaped Kaiparowits Plateau occupies middle ground. Its vast network of benches, flats and canyons are walled off from Escalante country by the Straight Cliffs, and from the Staircase by the bizarre fins of the Cockscomb formation. It is, as has often been remarked, a helluva place to lose a cow.

The ten men who set out on horseback from a raw Mormon settlement called Kanab in late May 1872 were not looking for cattle. They were looking for a boat. Over the next three weeks, they inscribed a 260-mile arc in the general vicinity of the monument, ending up at the confluence of the Dirty Devil River and the Colorado. They were led by Almon Harris Thompson, a 32-year-old educator, naturalist and geographer who was married to Powell's sister Ellen. Their objective was to recover the *Cañonita*, a vessel the expedition had cached near the mouth of the Dirty Devil the previous fall. Several of the men would take it on downriver; the others would go back the same way they had come.

At that time, southern Utah was still part of an enormous blank space on the map of America that the novelist and Powell biographer Wallace Stegner, a great admirer of redrock country, once described as "a chain of canyons more than a thousand miles long . . . entrenched up to six thousand feet deep in an unknown desolation as big as Texas." Powell, a one-armed Civil War veteran who would one day become the director of the Smithsonian Institution's Bureau of American Ethnography and, later on, head of the U.S. Geological Survey, was determined to find out what was in that terra incognita. After his first harrowing run down the Colorado in 1869, he hired Thompson to accompany him on the second passage and to undertake the mapping of the entire region, a huge job. As it turned out, Powell absented himself much of the time on personal business and politicking back in Washington, leaving his brother-in-law in charge.

"The Prof," as Thompson was known to his associates, had a steady gaze, a prominent nose and an enormous mustache that flopped over his mouth like a bushy door-

At Moody Canyon and other cliffsides in and around the monument, the sky's reflection often looks more like paint than light.

mat. Resolute, pragmatic and unflappable, he kept a meticulous trip diary in which he noted that he was disinclined to "gush." It was true. He downplayed hardships, accomplishments and his occasional impatience with Powell. Even his comments on malingerers were succinct: "He was a 'quitter' every time there was any hard thing to do."

After leaving Kanab and heading north up Johnson Canyon, Thompson and his companions followed old Indian trails along much the same route that is taken today by a bumpy dirt road called Skutumpah. Skirting the White Cliffs in the Staircase, they struggled across seemingly impassable badlands to reach the Paria River. Along the way, they found the scattered remains of a young Mormon who had been killed several years earlier by Paiutes. They took a fork east from the Paria above the upper reaches of the Kaiparowits Plateau, eventually coming into a valley where they happened upon a river they believed to be the Dirty Devil. They realized they were mistaken after Thompson and another member of the party clambered up a ridge in a wash about ten miles southeast of Escalante's future town site.

FROM THAT VANTAGE POINT, THE TWO MEN could make out the snow-streaked summits of the several mountains Powell later named the Henrys for one of his earliest supporters, Joseph Henry, the Smithsonian's first secretary. They knew the Dirty Devil ran east of those mountains, which meant that the river they had discovered was a new one altogether. It was, in fact, the last unknown river in the United States. Thompson decided it should be called the Escalante, after a Spanish priest who explored part of the Colorado Plateau in the 1770s.

They couldn't make a beeline for the Dirty Devil. "No animal without wings could cross the deep gulches in the sandstone basin at our feet," Thompson observed. So they had to go around. The men sniffed out a way up the Aquarius Plateau, then rode east across its shoulder through stands of aspen, pine and fir. They forded streams, encountered a number of emerald lakes and surprised a band of Indians—friendly ones, it turned out. After thus bypassing the worst of the canyon lands, they descended into Dirty Devil country and eventually reached the Colorado, where they found the *Cañonita*. "We had at last traversed the unknown to the unknown," a member of the group named Frederick Dellenbaugh later exulted. "If it had ever been done before by white men there was no knowledge of it."

Blazing a new trail to the Colorado, Thompson and his cohorts had endured the kinds of hardships explorers are supposed to endure: brutal terrain, ice, rain, illness, mosquitoes, thirst and even the intolerable snoring of one of their fellow travelers. Then, on the return trip, the implacable man in charge had to do it all over again. It was a fitting introduction to the formidable terrain he and his hardy crews would be mapping for the next six years.

In 1879, the Prof joined the U.S. Geological Survey in Washington, where he became chief geographer and remained until his death in 1906. Attempts to tame the wilderness he surveyed never got much past go. Some impressive parks and monuments were established, including Grand Canyon, Bryce, Capitol Reef, Canyonlands and Arches. The damming of the Colorado at Glen Canyon led to the designation of the immense Glen Canyon National Recreation Area.

As for the stupendous lands in the middle of all that, they remained mostly in the public domain but well out of the spotlight. Prospectors, cattlemen, hunters and other recreationists were able to do more or less as they pleased. Oil companies and coal-mining concerns filed a number of leases. On the conservationist side, several schemes were cooked up over the years to form a national park, monument or recreation area, but they were shot down, one after another, by ranchers and others who did not welcome the restrictions such initiatives would entail.

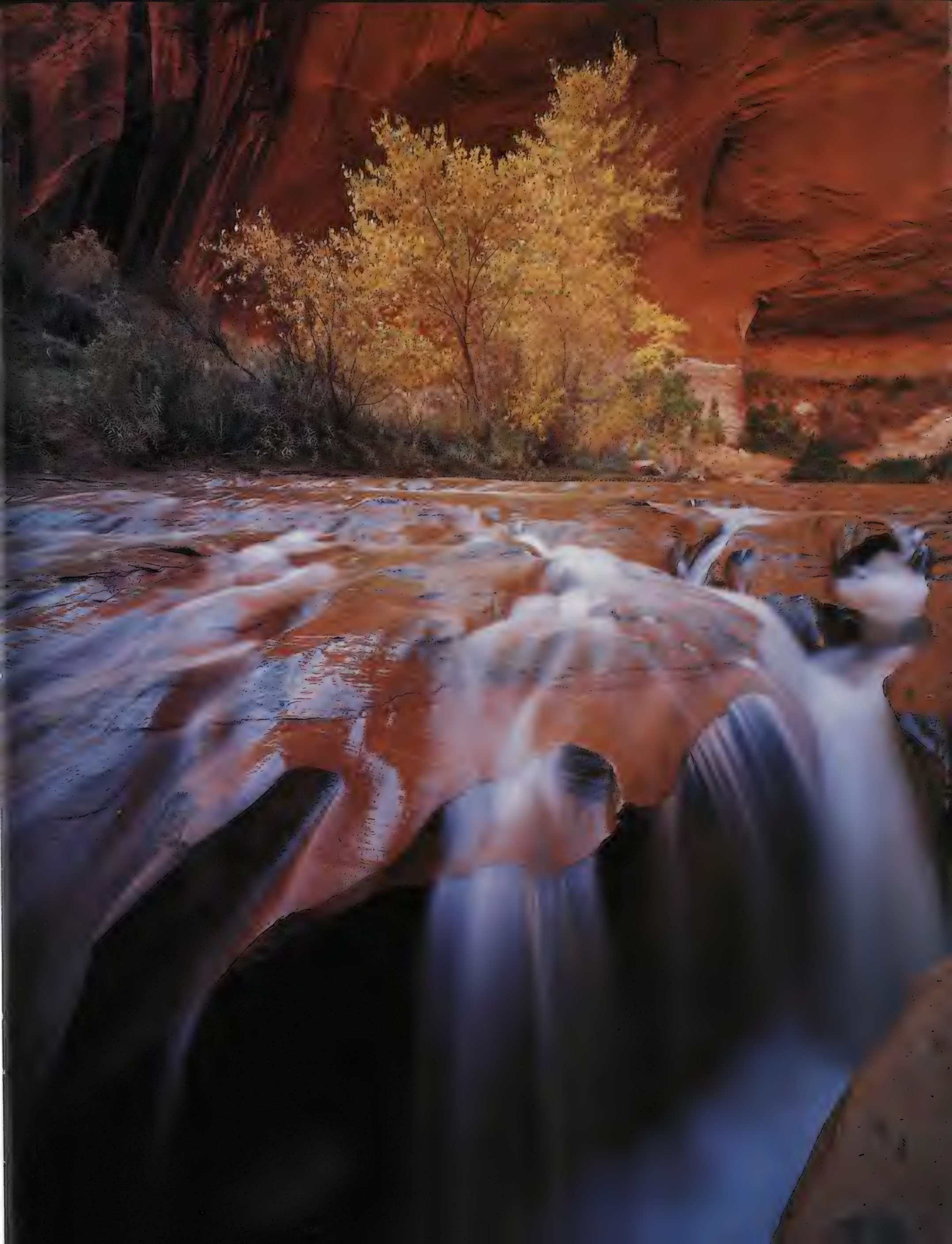
Then three years ago the President issued the proclamation establishing the Grand Staircase-Escalante National Monument. His announcement caught almost everyone by surprise, including the individual who would be in charge of the new reserve. A 20-year veteran of the U.S. Department of the Interior's Bureau of Land Management (BLM), Jerry Meredith had only recently been appointed the agency's district manager in southwestern Utah. As Bill Clinton spoke during a ceremony on the South Rim of the Grand Canyon, Meredith was hearing the news for the first time on his car radio. He shook his head and said, "Well, I'll be darned."

Utah's politicians and many of its citizens were outraged. It was clear, however, that in drafting the proclamation the President's advisers had shrewdly defused the likely opposition by leaving the monument in the hands of the BLM, rather than transferring it to the less user-friendly Park Service, and by explicitly directing that grazing, as well as "valid existing rights," would be continued.

Politics aside, the case for the monument is a compelling

Autumnal hues enliven Coyote Gulch not far downriver from the monument, in the Glen Canyon National Recreation Area.

Following pages: Poison ivy spells trouble in Death Hollow (left), whereas Calf Creek Falls (right) invites hikers to cool off.



In a panoramic view west overlooking canyons, Powell Point, at top right, juts south toward the multilayered Straight Cliffs.

one: it's the biggest museum you ever saw. It has no walls, halls, curators or archives—but such exhibits! And nothing is left out.

Geology? There are 270 million years of it. Ocean beds striped like layered cake and hard candy were thrust thousands of feet skyward here to be scoured by winds, contorted by quakes, washed away by rivers, stripped to the core and left exposed in all their naked majesty for geologists, paleontologists and the rest of us latecomers to ponder, study and admire.

Natural history? In one corner of the monument, scientists recently discovered hundreds of 18-inch-long, three-toed dinosaur tracks that were stomped into wet sand 165 million years ago. At the other extreme, consider the diminutive pack rat, which is actually a vole. This obsessive character is so named because it spends its life collecting junk it uses to build mounds, or "middens," over its nests. Pack rats often occupy the same nests for generations, each one adding layer after layer of grass, twigs, leaves, seeds, thorns and other stuff. Preserved for centuries in the dry desert air, the middens become time capsules researchers can study for clues to plant and climate changes going all the way back to antiquity.

Pack rats eat grass. Many other creatures in the monument eat them. Although it doesn't look like the kind of place that might support much wildlife, the monument's size, isolation and surprising plant diversity make it attractive to hundreds of species, from elk, coyotes and mule deer to snakes, raptors and lizards.

When it comes to human history, it's as hard to separate the real West from the imagined West in the monument as it is in the rest of this hugely mythologized part of the country. The imagined West originated here, as elsewhere, in the feverish importunings of the 19th-century boomers who tempted homesteaders with promises of free land, fertile soil and rain that followed the plow. It was further embroidered by popular writers like Zane Grey, who set many of his adventures in the tablelands of the monument, and by the Hollywood fabulists who filmed dozens of westerns in and around these precincts, and by their counterparts in television, including the crew that churned out some of the old *Gunsmoke* series in the frontier "town" now moldering away on Johnson Canyon Road.

Many real-life stories have ended the same way—prospectors abandoning claims, ranchers going under, failed grocers boarding up their store windows. Yet others have put down roots and survived. The Mormons were the first white settlers and remain a vital presence in places like Kanab, Escalante and Boulder, a hamlet so remote that it was still receiving mail by packmule in the 1930s.

The Sundance Kid and Butch Cassidy holed up hereabouts. For several centuries, before drought and the Lord

TOM TILL

PP. 98-99 DAVID MUENCH

only knows what else drove them away, the Anasazi and Fremont peoples lived here, too. One hot afternoon, Craig Sorensen, a BLM outdoor recreation planner, took us for a hike beside a bluff along the Escalante River, pointing out wicker granaries and footholds in the rocks.

Thompson's contribution to all this history, though significant, is little known. I first heard about him from another BLM operative, botanist Tom Leatherman. At Leatherman's urging, I obtained a copy of Thompson's diary from the Utah Historical Society. As I read it, it occurred to me that going where he went and doing some of what he did would be a good way to recapture the excitement of discovery that even his laconic notes cannot disguise.

Although it's possible to duplicate much of Thompson's route in a car, the best way to get a feeling for the area is to go in on the ground. When you do, you'll probably wonder, as we did at first, how he (or anyone else, for that matter) could keep his bearings in such an overwhelming place. It didn't take us long to figure it out. Whenever we got lost, we crawled up something high and took a good look around.

One morning we set out to scale a cinder cone in the Pink Cliffs known locally as Powell's Point because one of the explorer's crews—Thompson's, actually—supposedly did some survey work on it. The real Powell Point, a 10,189-foot landmark Thompson and his cohorts called "Table Mountain," is farther northeast. This one is located a short distance below Bryce.

Somehow we undershot Powell's Point and ended up on a neighboring peak instead, but the effect was the same. The entire monument and the lands beyond stretched out before us like a vast relief map. We could see all the way across the Kaiparowits, past the Waterpocket Fold in Capitol Reef National Park to the Henrys; north to the Aquarius Plateau, and southeast to the looming hulk of Navajo Mountain on the far side of Lake Powell.

The wind was howling through the junipers and scrub oaks clinging to that rocky summit. Watching a golden eagle wheel directly overhead, I had the sense that this is what history feels like. We had worked hard to get up there. On the way, we had come across mountain lion tracks impressed on the dusty trail. Now I was seeing what Thompson saw, hearing what he heard.

After making a U-turn in that wash near the Escalante River, the Prof and his men went up the Aquarius mainly by way of Pine Creek. According to Jerry Roundy, a local historian, their first campsite was probably on the creek about 20 miles north of Escalante in what is now the Dixie National Forest. Thompson came very close to gushing that night. "We are camped by a little brook," he wrote in his diary, "that leaps from rock to rock down the mountain side. . . . The water is pure, clear and cold."

As far as we could tell when we bedded down in that same vicinity one night, Pine Creek hadn't changed much. It still ran clear and cold, leaping from rock to rock between grassy banks bristling with fir, spruce and ponderosa. It was a noisy little thing, a brook that roared. In the morning, our drinking water was frozen solid and the bushes along the creek were hung with sparkling pendants. Negotiating the passage from canyons to high country, we, like Thompson, had gone from one extreme to another—from fire to ice.

THE ARID LANDS HAVE ALWAYS HELD A SPECIAL fascination for curmudgeons and loners. They seem to exert a special pull on older people, too. Rummaging around our dry camp in the Escalante wash after our long hike that first thirsty day, I got an inkling why.

All afternoon we had been trudging past walls that looked like rhinoceros skin, pitted where the fossils of little critters once had been, studded with encrustations where others remained. Both of us were grouchy by the time we called it quits. I went off in search of firewood and ended up in Erosion Central. Everywhere I looked: landslides, gullies, piles of rocks, columns of layered sandstone slumped over like crooked decks of playing cards.

I wondered: Are geezers like me drawn to places like this because we find something oddly beautiful—consoling, even—about the spectacle of deterioration and decline? Or is it just that human fossils prefer to hang out in neighborhoods where other fossils live? Whatever, I felt strangely at home there, surrounded by the rubble of the ages. It was nearly dark by the time I picked up my armful of sticks and stumbled back toward camp.

My partner and I managed to complete our grueling trek out of the wash the next day. The gallon jug of water we had stashed in the backseat of the car was still cool from the night before. We drank from it until we could drink no more, then poured the rest over each other in an orgy of conspicuous consumption. After that, we found it necessary to spend some time rehydrating more systematically in Boulder, which is still an authentic cowboy town of the sort where only a tourist would be seen wearing an Earth First! T-shirt.

Folks in Boulder, still riled, politely informed us that President Clinton's monument proclamation was, in so many words, the most despicable sneak attack on an American outpost since Pearl Harbor. We heard similar views expressed everywhere we went. Among the complaints usually enumerated: the monument was established in secrecy without local input; it is too big; it will lead to cutbacks in grazing and other traditional uses. Elaine Roundy (there are a lot of Roundys in southern Utah) grew up in Boulder, left and came back. "If you're a rancher or someone like me who liked it here the way it was," she said, "then you probably don't care for the monument because you know it's going to change this place."

Maybe it won't change all that much. When the final management plan comes out in the fall, Jerry Meredith told me, it will maximize protection and minimize road improvements and other tourist-related development. Ranchers, prospectors and hunters will be able to continue doing pretty much what they've been doing all along. But if the communities themselves opt for the kind of commercialization outside the monument that has recently transformed other gateway towns in the area—Moab, near Arches, for example, and Torrey at Capitol Reef—there isn't much Meredith can do about it.

Although it may be more difficult, now, to build a coal mine or drill for oil in the monument, other impacts are already being felt. The number of visitors has more than doubled since 1996 at the monument's Escalante welcome center alone. Boulder's growing population (currently about 220 residents) has forced the community to build a bigger elementary school. There are two new restaurants in town, a new B&B, a new store. In the Kanab area, the value of land near the monument has soared. Much of this probably would have happened anyway, but nobody denies that, at the very least, the designation of the monument made it happen faster.

It's hard to say what the Prof would have thought about all this. My guess is that he would have approved of the monument not only because he was a naturalist with a keen interest in geology but also because he knew from firsthand experience that the land wasn't good for much anyhow except wildlife and scenery. Reading his diary, you come to understand that he was a man who appreciated the character of the land he was exploring, in his own quiet way, and who realized he was lucky to have seen it in something close to its pristine state. Inasmuch as a very considerable part of it has now been preserved for all time, generations of his countrymen will be able to do likewise. Which reminds me: if you plan on heading out there anytime soon, take it from one who learned the hard way. Bring plenty of water.

Jim Doherty is a SMITHSONIAN *editor. David Muench's recent book,* Plateau Light *(Graphic Arts Center), celebrates the Colorado Plateau. Tom Till, a Utahn, takes pictures all over the world.*

A slot canyon at Round Valley Draw in the Grand Staircase was made not by a river but by floods from storms and snowmelt.

DAVID MUENCH

hot dogs are US

BY DONALD DALE JACKSON

IT'S NO STRETCH TO SAY THEY'RE MORE AMERICAN THAN APPLE PIE BECAUSE THEY LINK US ALL TOGETHER

FIRST, LET'S HAVE A SHOW OF hands: Who *doesn't* like hot dogs? OK, we know about you vegetarians. And some of you in the politically correct seats may be excused, and you citizens of obscure countries with retarded hot dog development. Anyone else? Kings, queens, presidents, ayatollahs? I see a few hands fluttering out there, but not many. We're going to try to be journalistically responsible here, so let's not say *everybody* likes hot dogs, let's say *almost* everybody does.

I know I do. When I was 12 or 13 and frequented the tennis courts at Golden Gate Park in San Francisco, I was infatuated with the juicy, steamed wieners at a concession stand near the merry-go-round. Puppy love, maybe, but I can taste them still. In the early, scuffling years of our marriage my wife cooked them with macaroni, or imbedded them in corn bread or smothered them with onions and barbecue sauce. Just the other day, after studying a valuable research document that I thoughtfully provided, she whipped up a tasty Three Weenie Salad.

Despite roots that go back to the wursts and sausages of Europe, and perhaps even farther, hot dogs are an American phenomenon. It was an American, although just which American is in dispute, who first inserted a warm frankfurter into a split roll and offered it with the condiment of choice. America remains hot dog headquarters and hot dog heaven, with rival hot dog hotbeds in New York and Chicago. Only in America would an institution exist named the National Hot Dog and Sausage Council, an industry group based in Arlington, Virginia. Only Americans would pack a plane with 37,000 franks, send it to our troops in Bosnia, as the council did in 1996, and call it "Operation Wienerlift." It's only here, on Coney Island, that world-class gluttons and their handlers assemble every Fourth of July to see how many wieners they can down in 12 minutes, and only here, in California, that an unencumbered spirit named "Uncle Frank" Webster publishes a journal called "The Frankfurter Chronicles: The Newsletter with Relish!" and aspires to establish a hot dog hall of fame, complete with a museum, restaurant and gallery.

Celebrities from Babe Ruth and Jimmy Durante to Jerry Seinfeld and Tony Bennett have been linked to hot dogs. Where did Bruce Willis supposedly propose to Demi Moore (and never mind that they're now Splitsville)? At Pink's hot dog stand in Los Angeles. What was the Babe's favorite dugout snack? Hot dogs. What did Franklin and Eleanor Roosevelt serve to King George VI and Queen Elizabeth at a

Whether it's a foot long with mustard in a bun or covered with corn bread on a stick, a hot dog is a hot dog is a hot dog.

Hyde Park picnic in 1939? You guessed it, with potato salad and beans.

Hot dogs have also shown an extraordinary ability to survive slanderous attacks on their reputation, dating back to their earlier incarnation as sausages, when the rap was that ground-up dogs, as in bowwow, were among the choice ingredients. This charge, which may have had some validity in the mid-1800s, lingered for decades as a kind of pre-television talk-show joke, and may have suggested the name that eventually emerged in the 1890s on college campuses and later at beach resorts like Coney Island.

In recent years the muttering about hot dogs has been health-oriented, focusing on their high fat content, the presence of sodium nitrites among their ingredients, and studies showing a connection between frankfurters and diseases such as leukemia. The most serious charges subsided in the absence of generally accepted proof, and hot dog makers seized the high ground by introducing fat-free or low-fat chicken and turkey dogs. At present hot dogs enjoy a repute that, if not quite politically correct, is at least politically inoffensive. At last count, two film documentaries on hot dogs were in the works; another, on dogs and other fast foods, aired on the History Channel last year. Even the (Naderesque) Center for Science in the Public Interest had friendly words for franks in a 1998 newsletter. The main grumblers at the moment are animal-rights advocates like those who carried signs suggesting that hot dogs contain puppies—the slander having come full circle—at a recent congressional hot dog feed.

Over the years, the hot dog has been used as a publicity prop as well as a comestible by film stars (above, from left: Bonita Granville, Helen Parrish and Judy Garland), heads of state (below, Fidel Castro) and Presidents, including (right) Eisenhower, Kennedy and Ford.

As a product, the hot dog's most endearing (and salable) quality is a kind of abiding nonseriousness. Hot dogs are fun. Wayne Norbitz, president of Nathan's Famous in New York, and Bob Schwartz, vice president of sales at Vienna Beef in Chicago, are both hard-nosed businessmen who spend their days thinking about the bottom line and the competition. But they talk about their product the same way. "Hot dogs are associated with good times and old times, sports and amusement and memories," Norbitz says. "We hear from people who want to be married at Nathan's or have a bar mitzvah there. We're intertwined with their lives." "It's a fun product," Schwartz says. "When I meet someone at a party and tell them where I work, they smile. People love hot dogs."

Hot dog history is a compendium of myths, guesswork and public relations inundating a scanty dossier of facts. The most dogged researcher in the field is a slim, curly-haired historian from Roosevelt University in Chicago named Bruce Kraig, who actually writes learned papers on the subject ("The American Hot Dog: Standardised Taste and Regional Variations") and can discuss it for up to 15 minutes without giggling. Kraig traced the first known references to *frankfurter wurst* to Frankfurt, Germany, in the 17th century. Greeks and Romans both munched on sausages, but it was the Germans and Austrians who made them a specialty. Frankfurters and wieners (from Wien: Vienna) were originally different from each other, Kraig explains, the frank being thicker and made

CULVER PICTURES; AP WIDE WORLD PHOTOS

with beef in the mix, while the longer, thinner wiener was commonly made with pork and veal.

German immigrants brought their sausage culture to the United States in the 19th century, and street vendors likely were peddling sausages as early as the 1860s. Their product was eventually called "dachshund sausage" for its resemblance to the low-slung German dog, which raises another possibility for the origin of "hot dog." A German named Charles Feltman, who sold pies from a cart on Coney Island, added a burner to his wagon and is generally credited with being the first visionary to fork a warm sausage into a split roll.

The most persistent myth in the murky hot dog archives concerns the origin of the name. The Hot Dog and Sausage Council, the folks at Nathan's Famous and several other dubious authorities maintain that it was coined in 1906 (or maybe 1901 or 1907) when Harry Stevens, concessionaire at the Polo Grounds in New York, decided to have vendors hawk the product in the stands at baseball games by crying, "Get your dachshund sausages hot." A newspaper cartoonist named Tad Dorgan, the story goes, drew a picture of barking dachshunds between buns and labeled them "hot dogs" because he couldn't spell "dachshund."

The trouble is that no one has ever been able to find the cartoon, though Dorgan was a popular and prolific *New York Evening Journal* artist. As for the first use of "hot dog" as a sandwich, a pack of word experts led by Prof. Gerald Cohen, of the University of Missouri/Rolla, and Barry Popik, a New York lawyer, have been pursuing evidence for several years. Popik, who combines a self-assured manner with a facial expression of chronic surprise, concentrates on studying old college magazines. The earliest hot dog mention he has come up with so far was in a story from the *Yale Record* of October 19, 1895, titled "The Abduction of the Night Lunch Wagon" in which students "contentedly munched hot dogs."

By the 1890s, Americans were gobbling them up whatever they were called. Sausage vendors at the 1893 Columbian Exposition in Chicago, among them a local butcher named Oscar Mayer and the two men who eventually started the Vienna company, did a brisk trade. "Hot frankfurts" were going for a dime at a diner in Springfield, Massachusetts, and "dog wagons" were a nighttime staple at several Eastern colleges. Meanwhile, Charles Feltman, The Originator, had parlayed his pie-and-frankfurter wagon into a restaurant complex so grand that by 1900 he employed 1,200 workers who could serve 8,000 consumers at a time.

Feltman passed quietly into Coney Island history, but a fellow who worked for him as a roll-slicer became hot doggery's most famous name. Nathan Handwerker, a Polish immigrant, may well be an authentic only-in-America story, but the Nathan saga has been laid on so thick for so long that it has become difficult to separate the meat from the relish. The story is that entertainers Eddie Cantor and Jimmy Durante, who worked for Feltman, persuaded Nathan to invest his $300 savings in a rival stand that would sell hot dogs for a nickel instead of a dime. One version has Durante and Cantor actually loaning Nathan the money. Whatever the truth, he used a garlicky recipe concocted by his wife, Ida, and opened up shop in 1916.

Someone pointed out that his stand lacked a name. When Sophie Tucker popularized a song called "Nathan, Nathan, Why You Waitin'?" customers told him, "You're becoming famous," and the name Nathan's Famous was born. When the crowds were initially small, he hit on the idea of getting interns at Coney Island Hospital to mill around his stand in their white coats, munching on dogs. Did sales climb? You bet. Later Nathan posted a $1,000 bill behind the counter as a reward for anyone who could show that his french fries were not cooked in 100 percent corn oil. Was the bill real? Don't ask.

By the 1920s, hot dogs were a mainstream delight, deliberately marketed as patriotic, democratic fare. "They were Americanized through their association with public events," Bruce Kraig says. "People ate them at baseball games, horse races, fairs and circuses." To nosh a frankfurter at a game was to shed your ethnicity and become American, as good as anyone else. Hot dogs were a perfect fit with the pace of American life; you could eat one on the

AP/WIDE WORLD (2); UPI/CORBIS-BETTMAN; PP. 104-105 RENEE COMET (2)

More than a quarter-million franks are served up annually at Superdawg in Chicago, a classic drive-in where the customers park, order and wait for car hops to deliver the goods.

run, hold it in one hand. Advertisers zeroed in early on the nostalgic appeal of hot dogs, good times and good memories.

When times turned bad in the 1930s, the hot dog or "tubesteak" was a cheap meal. Fluky's hot dog stand in Chicago offered a "Depression Sandwich"—hot dog and fries—for a nickel, or four cents if that's all you had. It was also in the 1930s that manufacturers began making a milder, blander dog aimed at children, while continuing to produce a spicy version for sale at hot dog stands and street vendors. Not coincidentally, Oscar Mayer's first "Wienermobile," a promotional kiddie car shaped like you know what, hit the street in 1936.

Hot dog styles vary around the country. Though the franks themselves have become more or less standardized—the most common size is two ounces—toppings and fixings provide local color. Chili dogs, though available almost everywhere, are especially popular in the Southwest. Southerners favor corn dogs, and slaw dogs crowned with coleslaw. New Englanders are partial to franks and beans, while in Kansas City they top them with sauerkraut and melted cheese. But all these regional variations pale in comparison with the preeminent schism in the hot dog world, dogland's equivalent of the Cold War: New York versus Chicago.

The New York and Chicago hot dog camps eye each other like sullen heavyweight fighters. Partisans disagree on everything—how to cook dogs, what to put on them, even how to make them. New York dogs are traditionally all-beef with garlic or spices in their ingredient mix. Chicago style is usually beef, but it can be mixed with pork and contains more seasoning. In New York, dogs are

usually grilled; in Chicago, they're steamed or boiled. New Yorkers customarily spread mustard and onions on franks they buy from a pushcart vendor and usually add sauerkraut. Chicagoans get them at stands and load them up with mustard, bright-green relish ("We call it nuclear relish," says one Chicagoan), onions, tomato slices, pickles, peppers along the sides of buns and maybe a sprinkle of celery salt. The Chicago expression for this festival of garnishing, put on in this order, is "dragging it through the garden."

"The Chicago hot dog evolved in the 1930s," researcher Bruce Kraig explains, "when most of the stands were built. Neighborhood stands are Chicago's delis and diners. It's a melting-pot city and putting everything on a hot dog reflects that. And Chicagoans like abundance."

Rich Bowen and Dick Fay, a pair of Chicago psychologists who wrote a guide to Chicago hot dog stands and other fast-food joints, equate the franks with the city itself—"brawny and tough. It is honest food," they wrote. "Only the most skilled Chicago politicians can eat a hot dog and at the same time claim to be something he (she) is not."

The Chicago party line on New York dogs is curt and dismissive. "What a laugh a New York City hot dog is," Bowen and Fay jeered. "It's just a limp little wiener drowning in gloppy stewed onions and sauerkraut." Bob Schwartz of Chicago's Vienna Beef company, who keeps a huge jar of fat-free pretzels on his office desk, alleges that "what they put on a hot dog buries the taste rather than enhancing it. The condiments are overpowering."

In defending New York, Wayne Norbitz, president of Nathan's Famous, adopts a stance of above-the-fray serenity: "In the first place, we griddle them the way God intended hot dogs to be served. In Chicago, they put an entire salad over the hot dog because they're embarrassed at the way it tastes. It's sad, really. You wonder if there's a hot dog under all that. I guess as long as they continue to use meat they can still call it a hot dog."

Neither side has done well in raids on the other's turf. Vienna, the dog of choice at most Chicago stands, misfired in an attempt to open an outlet in Philadelphia. Nathan's, to the considerable glee of the Chicagoans, folded after a run in downtown Chicago that lasted less than a year—"about a New York minute," Schwartz crows. "I was stunned to see that they served Nathan's dogs cooked on a griddle," Kraig recalls with a shudder. "And they had you put on your own condiments, which isn't the Chicago way either."

Vienna Beef, unlike Nathan's, makes its own hot dogs. (Nathan's has them produced to its specifications, and one of the factories that makes them, ironically, is in Chicago.) Schwartz, who led me on a tour of the Vienna plant on Chicago's North Side, showed me the Volkswagen-size machine, called an emulsifier, where the raw bull beef and brisket is ground up and mixed with spices and water. When it emerges it looks like a smooth, gray-brown pudding. The meat then goes through tubes where the skinlike casing, made from sheep intestines, is applied, after which the franks are smoked for three hours. Though Vienna and Nathan's both make only all-beef franks, other companies use pork, chicken, turkey and even tofu, and some add fillers (usually cereal) called "extenders." Animal hearts, livers and kidneys, euphemistically known as "variety meats," also turn up in some dogs.

Whatever his hot dogs contain, you'll hear no complaints from a remarkable 88-year-old man from Los Angeles named Charlie Kazan. Charlie had his first hot dog at age 11 months, and he's eaten them every day of his life since. "I couldn't hold any other solid food down," he says, "so my mother fed me hot dogs." Doctors couldn't explain it, so Charlie stuck with his own prescription as an adult: orange juice and cereal for breakfast; a baloney sandwich for lunch; two pork-and-turkey hot dogs with rye bread, coffee and pastry for dinner. Every day. No variation. "I was ashamed to tell anyone," he says,

Nathan's Famous on Coney Island has been serving up its all-beef franks and other gustatory delights since 1916.

RAFAEL MACIA/PHOTO RESEARCHERS

Chicagoans like hot dogs buried under a pile of tomatoes, pickles, peppers and relish. New Yorkers prefer theirs with onion and mustard, and usually add sauerkraut.

"but about seven years ago I heard on the news that they might have to stop selling them. I wrote the president of Oscar Mayer, he sent a Wienermobile around to my house, and the next thing I knew all three networks were out front." He claims that he loves franks still, "just like the first time." It's no wonder. "Hell, my doctor says I may live to be 130."

While not as loyal as Charlie, politicians from Nelson Rockefeller and Bob Dole to Nikita Khrushchev have been photographed chomping hot dogs. A hundred Washington lawmakers, plus innumerable free-loading staffers, showed up last July (along with animal-rights protestors) to help put away 4,300 wieners at the National Hot Dog and Sausage Council's annual Capitol Hill lunch. Many of them contributed regional-flavored (and constituent-pleasing) dishes—"Dog au Vin" (from a Californian), the "Washington Spiced Apple Dog," "Maryland Crab Dog," "Florida Swamp Dog"—to the council's *Congressional Hot Dog Recipe Book*.

President Clinton is another fan. Bob Schwartz tells a story about a friend of his from Hawaii who invited the President to a hot dog barbecue at his home a few years ago. "The President was coming back the next year," Schwartz says, "and his secretary called to ask if they could do it again. So they did, and one of the Secret Service men asked for ketchup on his dog. My friend wouldn't give him any. You just don't put ketchup on Chicago-style hot dogs. The President piped up and said, 'They wouldn't give me any either.'"

Former New York mayor Ed Koch was a notably ardent hot dog fancier. "He'd eat two at a time," Wayne Norbitz of Nathan's recalls. "He was at Coney Island once for a campaign photo op, I was serving him, and he was complaining about the price; I think it was $1.50. He said, 'I remember when they were a quarter.' I said, 'Mr. Mayor, I remember when the subway fare was a quarter.' He went nuts, yelled at them to turn off the cameras. Then he winked at me."

Janet Riley, the Hot Dog Council's spokesperson, is a freckled, impish, thirtysomething flack who calls herself the "queen of ween." Her approach to her job is a deft blend of whimsy and advocacy. "People still think there are weird things in hot dogs, like snails and puppy dog tails," she says. "The question I'm asked most is, 'What's in them?' I say there are no surprises."

Riley orchestrated a public relations coup of note a few years ago, after three members of the Seattle Seahawks football team were fined for eating hot dogs on the sidelines. In a widely distributed letter to the team's coach, she protested that the players were "acting on an instinctive American impulse." She explains: "I told him to lighten up."

Riley is candid about the hot-dogs-per-annum number she routinely dispenses to the press. "We say an estimated two billion pounds of hot dogs are produced a year and figure that means about 20 billion consumed. But there are no good statistics for consumption." Her forte is dreaming up stunts like her guide to hot dog etiquette. The do's-and-don'ts list includes "Don't send a thank-you note following a hot dog barbeque" and "Don't take more than five bites to finish a hot dog (seven bites are acceptable with a foot-long)."

But the hands-down wiener and still champion of frankfurter flackery is the annual Fourth of July hot-dog-eating contest at Coney Island sponsored by Nathan's and choreographed by a gifted PR man named George Shea. Shea, who manages to look like a Damon Runyon character despite a Maine upbringing, describes himself without false modesty as "the Homer,

RENEE COMET (2)

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Hot-dog-eating contests have been going on for a long time. In this archival photograph of one, it is not hard to pick out the contestant most likely to prevail.

the keeper of the archives" of the contest. "There's a kind of absurdist art to it," he explains. "Some people get it and some don't. The ones who don't are always writing about contestants who can't cut the mustard or don't relish the competition."

The current champion, holder of what Shea always calls "the coveted mustard yellow international belt," is a 131-pound Japanese jewelry salesman named Hirofumi Nakajima, who defended his title in 1998 by bolting 19 dogs in the allotted 12 minutes, 5 ½ dogs short of the amazing record he established a year earlier. "Size doesn't matter," Shea says, "it's technique. One trick is to expand your stomach by drinking a lot of water for two or three days before. Also, you have to crunch the bun, make it as small as you can, and take a lot of small bites."

In his role as contest archivist, Shea has uncovered the great 1930s rivalry between Andrew Rudman and Stan Libnitz, the baffling disappearance of the belt for several years and its storied value ("No one knows what it's *really* worth"). The archives have passed, with loving care, from publicist to publicist. "Much of this cannot be verified," Shea says regretfully. "Let's just say the history is—anecdotal."

The contest has been a publicity bonanza for Nathan's. "I saw it on CNN while I was in Russia," Wayne Norbitz says. It also reaffirms the singular, fun-on-a-bun foolishness of hot dogs. "The truth is, it's a riot," says Shea. "I mean, who would do this? Could you do it with any other food? I doubt it. Ultimately it's for the fun of it."

J. Frank "Uncle Frank" Webster, the quirky hot dog chronicler from Fairfield, California, would doubtless agree. Uncle Frank was knocking around after his return from Vietnam in the 1970s when his mission in life suddenly became clear to him. "It was hot dogs," he says proudly. He first peddled them from a motorized cart equipped with hot dog music, then from trucks and finally from a store. When that folded, he began accumulating thousands of hot dog artifacts of every description for what he hopes will become the Hot Dog Hall of Fame. "If it doesn't," he says, "I'll give it to the Smithsonian." Eventually Webster began publishing "The Frankfurter Chronicles."

The newsletter, which appears irregularly, is like a missive from a likable, unpredictable, slightly off-the-wall but boundlessly enthusiastic relative. Its columns are a clearinghouse of hot dog trivia: a drawing showing how to signify "hot dog" in sign language; bumper stickers he has admired ("I didn't get to the top of the food chain only to eat vegetables"); recipes; progress reports about the hall of fame, and announcements of "Frankie" award winners for notable achievements in hot doggery.

Webster hopes to open a combination hall of fame, museum, gallery, restaurant and gift shop. "The world needs to see this stuff," he contends. He has in mind a book (Hot Dogs in a Cold World) and a film, but sometimes he questions his stamina. "I've only had five this month," he laments. "I can't eat them like I used to. There's a limit."

I know the feeling, Uncle Frank, but I'm going to have one anyway.

Mr. Jackson, a Connecticut freelancer who some years ago wrote a story for SMITHSONIAN *about dieting, confesses he is not now and never has been a discriminating eater.*

ARCHIVE PHOTOS

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The Great Goddess *Devi*

Is she one, or is she many? The powerful Hindu deity assumes myriad guises

SHE HAS A THOUSAND NAMES AND FACES—AND COUNTless tasks and talents. Even as a fierce warrior heroically slaying the most vicious demons, she retains her composure and radiant beauty. Westerners accustomed to a "Heavenly Father," and to seeing virginal, subdued images of the Madonna, might find Devi and her wildly vigorous feminine power quite startling.

For many Hindus, however, Devi's greatest strength is that she embodies *all* aspects of womanhood. In the vast pantheon, she is in the top tier, as powerful as the male gods Vishnu and Shiva. Mother goddess of India and local protector for innumerable villages, she can be quiet and nurturing. But she is also a cosmic force, addressing the creation and destruction of worlds. On occasion she is voluptuous and alluring—a playful temptress, a passionate lover. Before exams, Hindu pupils pray to her, incarnated as Sarasvati, the goddess of music and learning. Devi blesses her devotees with fortune and success.

Her most renowned victory, depicted at left, is the slaying of a buffalo demon, a brutishly ignorant, bloated egotist. Before Devi came to the rescue, he had defeated a host of benevolent gods. With one of her 18 arms, at the height of the battle, she effortlessly pulls the demon out of his buffalo body with a red noose. Her mount, a tiger, gnaws the head. All the while, Devi is garbed in the gilded and embroidered costume of a Punjab Hills princess. In the clouds above, gods celebrate her triumph by tossing down golden blossoms.

"It is astonishing that there hasn't previously been a major exhibition about her," observes Vidya Dehejia, curator of "Devi: The Great Goddess." On view at the Arthur M. Sackler Gallery through September 6 (and in part at www.smithsonianmag.si.edu), this magnificent show features 120 artworks representing a 2,500-year time span and a wide range of styles. *—Bruce Hathaway*

Left: *Devi Battles Buffalo Demon Mahisha*. Right: A bronze elongated figure captures a tribal craftsman's vision of the goddess.

Devi is portrayed with a boar's head (left) to represent an alliance with the male god Vishnu. The painting is from a series of 70 works (c. 1660) that convey the strength and beauty of the Great Goddess.

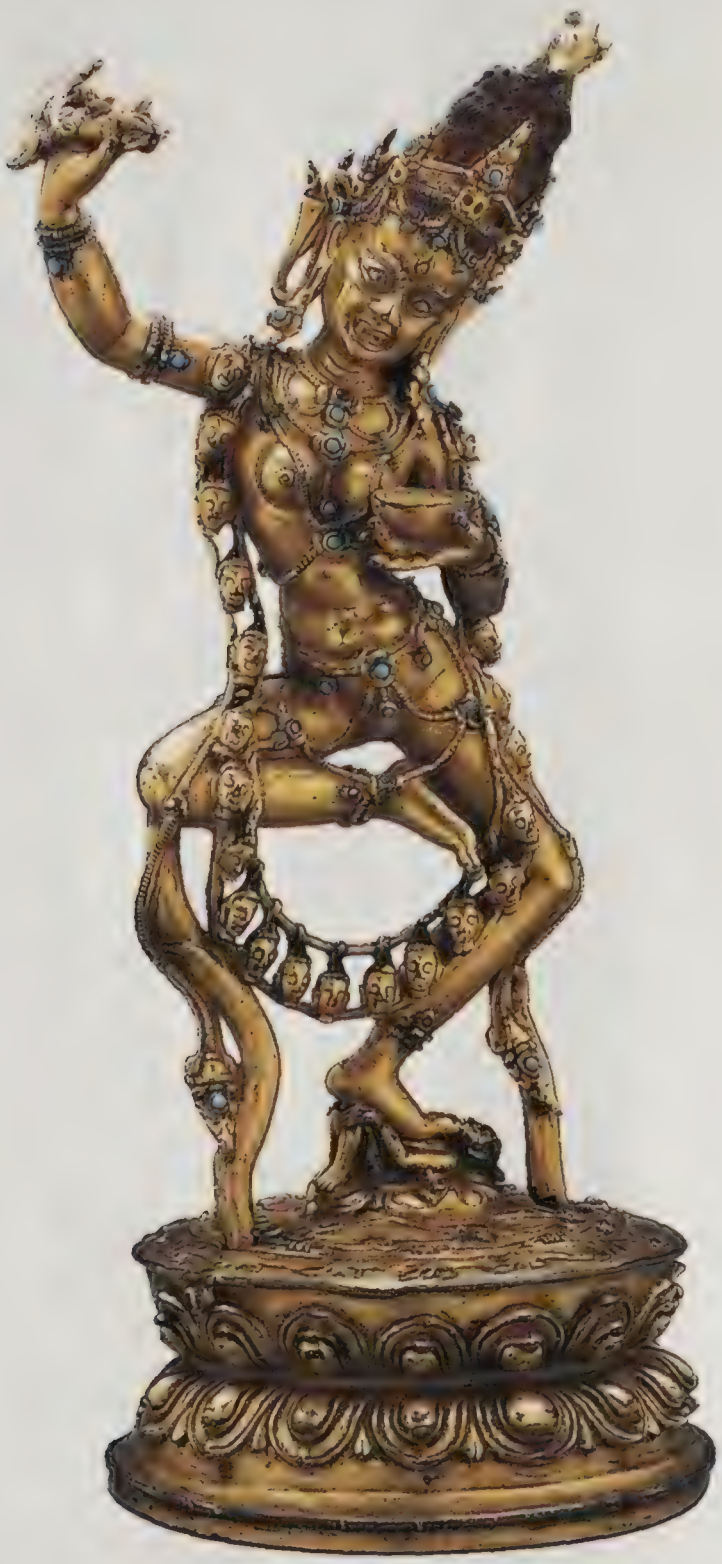
In *Ugratara and Shiva* (left), c. 1745, a meditation aid for learning "detachment," Devi, as the blue Ugratara, and Shiva are relaxed and self-assured despite their fearsome surroundings, a cremation ground.

Resplendent in lotus petals, which symbolize fertility and purity, Radha (a cowherd girl but also Devi in the role of lover) and Krishna, lord of the universe, blissfully gaze into each other's eyes.

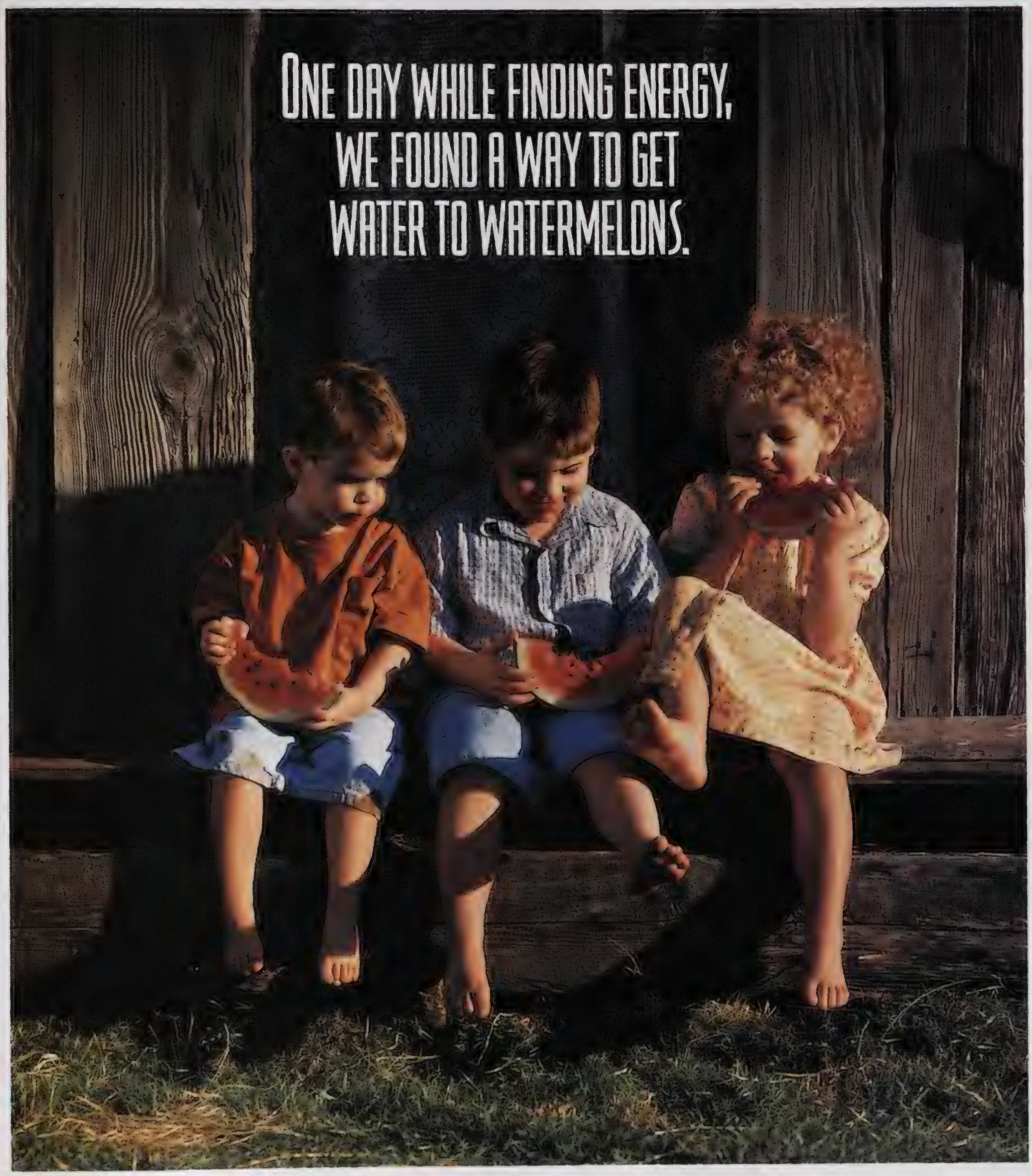
In *River Goddess Ganga on Her Fish Mount*, Devi, floating on a pool in the Himalayas, personifies the Ganges. Like the sacred river, Devi descended to the Indian plains from those mightiest of mountains.

This curvaceous sandstone fragment, carved in the second century A.D., is likely a *yakshi*, a semidivine form of Devi who bestows on her devotees the gift of fertility in both field and womb.

As the alluring-but-fanged goddess Vajravarahi, depicted in this c. 13th-century bronze, Devi rids the world of falsity and delusion. With her knife and skull cup, she chops up the entrails of enemies.



Tigers are a real threat to tribal peoples living in India's jungles. Hoping for the Great Goddess' protection from the animals, villagers often venerate images—like the one above—of her mount, a tiger.



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markets

"THAT'S A NEAT LINE OF CLOUDS."

From the driver's seat, Susan Planck points to a low band of gray boldly struck against the palest hint of orange. Though it is only a tad after 5 o'clock this early August morning, the 57-year-old farmer is late. Since 4 A.M., she has been writing white cardboard price signs, green and blue and red felt-tip markers spread around her in systematized disarray. Now, the signs and nearly a thousand pounds of produce, along with four dozen brown eggs, white plastic tarps, wooden folding tables, metal poles, scales, two cookie tins heavy with coins, and one pigtailed college student and summer helper named Cate, roll swiftly past fields in a well-used pickup truck. The scent of basil wafts sweetly through the cool air. Fifty miles and millions of people away, the Washington, D.C. Open Air Farmers' Market awaits.

Before dawn in the kitchen of her Virginia farm, Susan Planck sorts eggs to sell at the Washington, D.C. Open Air Farmers' Market.

By 6:30 on what has turned out to be a brilliant summer morning, Planck maneuvers into an enormous sea of a parking lot along a quiet residential neighborhood. Half a mile beyond the shadow of raised subway tracks, the ghostly monolith of Robert F. Kennedy Memorial Stadium looms. The market is in the full swing of setup. Metal poles clatter against asphalt as a crisp breeze blows in from the nearby Anacostia River. Some farmers have upturned plastic baskets, onto which they place plywood sheets and pyramids of green beans, potatoes, corn, tomatoes and cantaloupes. Others gamely toss watermelons twice the size of a basketball from truck to waiting arms.

In the space of a few minutes, Planck and Cate transform their mass of poles and tarp into neatly pitched roofing, welcome shade for customers and produce alike. As they quickly fill quart boxes with eggplants and squashes, their displays begin to take shape. By 7, the market's first customers arrive—on bicycle, on foot, by rollerblade and in a growing snake of cars busily wending its way into the lot. More than 5,000 people will visit today, sampling, prodding, pricing—and buying.

It's a ritual that Susan Planck has been part of every summer Saturday since 1980—nearly as long as she and her husband, Chip, have run Wheatland Vegetable Farms, their 60-acre property in the foothills of the Blue Ridge, in Northern Virginia. From May through October, at 16 farmers' markets around Washington, D.C., the Plancks and their corps of summer workers—usually 18 to 20 college-age would-be farmers—sell the fruits and vegetables they plant, tend and harvest.

More than mere livelihood, Wheatland's market treks pay homage to a newly resurgent way of life. From parking lots in tiny towns to public squares in our largest cities, farmers' markets are enjoying a renaissance harkening back to a beloved American tradition that all but died just a few decades ago. The supermarkets and convenience stores that replaced many farmers' markets are still around, of course. But with food typically traveling 1,200 miles before it arrives on your table, it is somehow, well, refreshing to get corn picked just hours before from that farm several miles down the road. Not to mention sampling Brandywine, Pineapple, Early Girl and dozens of other tomato varieties, all heavy with ripe juiciness. And where else can you actually tell the people who grew them how much you loved those blueberries last week? "It's more down to earth at the market," says longtime Wheatland Farms customer Bobby Baker. "I used to grow my own tomatoes, but after I tasted Susan's, I said, 'Why bother?'"

By any measure, Americans love farmers' markets. According to U.S. Department of Agriculture estimates, we spend $1.1 billion annually at more than 2,600 markets—with the total number of markets up 50 percent from just five years ago. For Undersecretary of Agriculture Gus Schumacher, himself a descendant of farmers' market vendors in New York City, markets work for simple, but powerful, reasons. "Farmers don't need a big overhead, just an umbrella, a pickup and a good crop," he says. And, he notes, "there is such a variety of fresh, high-quality products that consumers can't get at the supermarket." Savoring the memory of some five different types of peaches at a local market, he adds with a laugh, "You also get free samples."

Whether it's fruits and vegetables or homemade cakes

and preserves that attract them, for many customers farmers' markets promise something even more: freshness. "Handling living food is so inspiring and energizing it makes you want to cook," raves chef Alice Waters, a pioneer in featuring farm-fresh ingredients at her acclaimed Berkeley, California, restaurant, Chez Panisse. "There are times of the year when we can hardly wait to go to the farmers' market, in anticipation of the treasures we will find there." Catching this wave of interest in fresh food—and its attendant health benefits—some grocery franchises even tout locally grown produce as an enticing feature in their stores.

Beyond lovely lettuce and leeks, the attraction of farmers' markets is fundamentally a human one. Environmental psychologist Robert Sommer, of the University of California at Davis, has discovered that shoppers have seven times as many social interactions in a farmers' market as they do in a grocery store. Conversations between producers and buyers hold benefits for both. "A customer may say to me, 'I'm so glad the spinach is in. I know it's here for only three weeks,'" says Chip Planck. "It's not that this customer likes spinach better than, say, corn, which comes in later. That awareness just makes a better market for selling spinach."

By 9 A.M. at the D.C. Open Air Farmers' Market, the smell of roasted peanuts from one end drifts deliciously downwind while a flower vendor sets up tall, deeply hued gladiolus in plastic buckets. Next to him, patrons shuffle to get to coolers filled to overflowing with fresh kidney, lima and black beans. Farther down, crab, croaker, haddock and trout beckon past numerous displays of freestone peaches.

Above: Chip Planck drives as helpers ride a transplanter, planting kale and cabbage for fall harvest. Opposite: Susan Planck readies flowering plants for market.

At Wheatland's stand, tomatoes are going quickly as Cate unloads more and Susan Planck busily calculates weights and prices for a line of customers. "Just look at all those squashes," remarks an elderly woman strolling slowly by the tables that Susan has artfully covered with zucchini, yellow summer squash and pale green Middle Eastern (also known as Mexican) squash. How a display catches a customer's eye is part art—and all good business. "The unregulated nature of these markets is so wonderful," notes Susan. "There are no doors, no locks, no police, but the displays are beautiful—and it's all self-motivated."

Some of the signs that occupied Susan's waking hours now poke through her displays in red, blue and green blazes. "We grow everything we sell," says one. Another relates how Wheatland's crops are grown without pesticides. Recipes for cucumber salads sit next to neat, if prickly, piles of Asian, slicing, Middle Eastern, burpless and pickling cucumbers. As Cate advises customers on just the right tomato from the 15 varieties that Wheatland is offering today, Susan quickly stuffs a few bonus squash into a customer's bag. "It's a wonderful social thing," she says with a huge smile.

It's also fairly new to most of us today. The revival of farmers' markets can be traced back just over 20 years to several places, none more important than California, where public concern about food sources came early. There, farmers and consumers protested laws prohibiting direct sales to consumers. This state of affairs coincided with a 1976 cannery strike that forced peach and apricot growers to choose between selling their fruit at a severe loss or just letting their harvest rot. The protests led to revised regulations—and to the creation of the state's certified farmers' market program. Today, 4,000 California farmers sell their produce and other goods directly to consumers in more than 350 certified markets around the state.

But if there is a godfather of the farmers' market renaissance, it may well be Barry Benepe. In 1975, he helped establish New York's Greenmarket farmers' markets to provide fresh food to the city and to preserve local farmland. Now, with nearly 200 farmers selling to as many as 150,000 people every week in 28 markets around the city, the Greenmarket program is an enviable urban model.

Then, as now, loss of farmland—as much as 50 acres per day, according to the American Farmland Trust—was key. Near cities, pressure to develop open spaces is often as heavy as demand for food. And without farmers' markets, many small farms, often with too modest or specialized a harvest to interest wholesalers, are left out of the food cycle. "As a child, I had lived on a farm," Benepe reflects. "Some of this experience rubbed off on me. I had a real feeling that the system was going to kill the small farmer."

Francis Roland knows this well. For 20 years, the former TV repairman has cultivated 20 acres left over from his father's 50-acre Maryland farm just ten miles outside Washington, D.C. "I'm all for these markets. Otherwise, I couldn't keep my farm," he says after ringing a bell, an old tradition to start and end the market day. "I like growing and selling to people who use my produce," he reflects. "It gives me a real good feeling here"—he thumps his chest—"when people come back the next week and say, 'Boy, what I bought from you was great.'"

Like many farmers' markets across the country, Washington's Open Air Farmers' Market began in the wake of the Greenmarket and California programs. At its start in 1980, market founder and manager Al Smith envisioned providing food for neighborhood residents denied the convenience of a nearby, inner-city grocery store. Through the years, the market has blossomed beyond that original goal. "It's a lifestyle," Smith says. "We're talking about tradition, history and the importance of having farmers access their supply to the region: What if something happens to the farmers in California?"

Farmers' markets have deep roots in our history. When the White House larder was bare on July 6, 1806, President Thomas Jefferson accompanied his maître d'hôtel to a Georgetown market and bought ten pounds of beef, eight dozen eggs, a case of onions and four pounds of assorted vegetables. In 1786, Benjamin Franklin considered Philadelphia's High Street market so "well-furnished" and "plentiful" that he converted his own city garden to grass and gravel walks. According to market consultant and historian David O'Neil, many American cities literally grew up around the markets that fed them.

Certainly that was the case in Lancaster, Pennsylvania. One of the country's oldest farmers' markets, Central Market is housed in a handsome Romanesque Revival building erected in 1889 on the site of thriving market sheds. Those wooden structures had been an improvement on an 18th-century open-air market on the same site. "British soldiers loved it," says Linda Aleci, Friends of Central Market coordinator. "They were always talking about the great cider they could get there."

You can still get great cider at Central Market, in addition to regional delicacies such as pig's feet souse (typically, spiced meat in vinegary, gelatinous blocks), apple fritters and Hodecker's bleached celery (which, contrary to its

name, is not treated with bleach but is pale green and exceptionally tender). "We have people who move up to Maine who call up at Thanksgiving and Christmas saying they've got to have Hodecker's for the holidays," says market master Don Horn. "Now, the cost of the shipping alone is more than the celery itself, but they've got to have it."

Horn occupies a time-honored position in the history of farmers' markets. "There's always been a market master here," he says, overlooking more than 200 stands from his office perch 12 feet above the crowded market floor. On market days, he is here from 1:30 A.M. on, opening doors for early arrivals and shutting the place down at closing, in the late afternoon.

Veteran markets like Lancaster's are remnants of an earlier, less mobile era. As the nation celebrated its centennial, Philadelphia alone had 28 indoor markets and seven large street markets. More than half of all American cities with a population of 30,000 or more sponsored municipal markets in the first decades of this century. Beginning in the 1920s, refrigeration and better roads threatened the very existence of markets. Suddenly, food could travel hundreds, even thousands, of miles and still be edible. Wholesalers gradually began taking over the remaining markets, selling produce bought from farmers in a wide area to the supermarkets and grocery store chains that now were the nation's primary source of food. Only a fraction of older market buildings, like Washington, D.C.'s Eastern Market and Seattle's venerable Pike Place Market, escaped demolition or conversion to other uses.

According to David O'Neil, many of today's open-air markets are following the same development patterns of their predecessors: from open-air bazaars, to semipermanent sheds, to grand public structures. At least five cities, including Milwaukee, Wisconsin, Nashville, Tennessee, and Portland, Maine, have recently built or are planning to build or renovate their own market buildings. Some of the structures are on the site of existing open-air farmers' markets. And even with the building boom, interest in open-air markets continues apace. "Every city wants a market that doesn't have one," says O'Neil.

It's no wonder. By 11 A.M., as hundreds of cars fill the broiling asphalt lot at the D.C. Open Air Farmers' Market, groups of older women sort through crates of ruffled kale, collard and mustard greens. Talk about the excellent grapes down the way, and how good the pole beans are this year, is bandied about. Nearby, friends, children and neighbors gather in small familial islands amid waves of marketgoers. At Wheatland's stand, a group of young men consulting in Spanish buys several bushels of the Middle Eastern squash. Near the tomatoes, two curious terriers strain against their leashes toward each other while their owners examine sorrel, thyme and mint plants. Contentment, and happy sociability, are as fresh as the food.

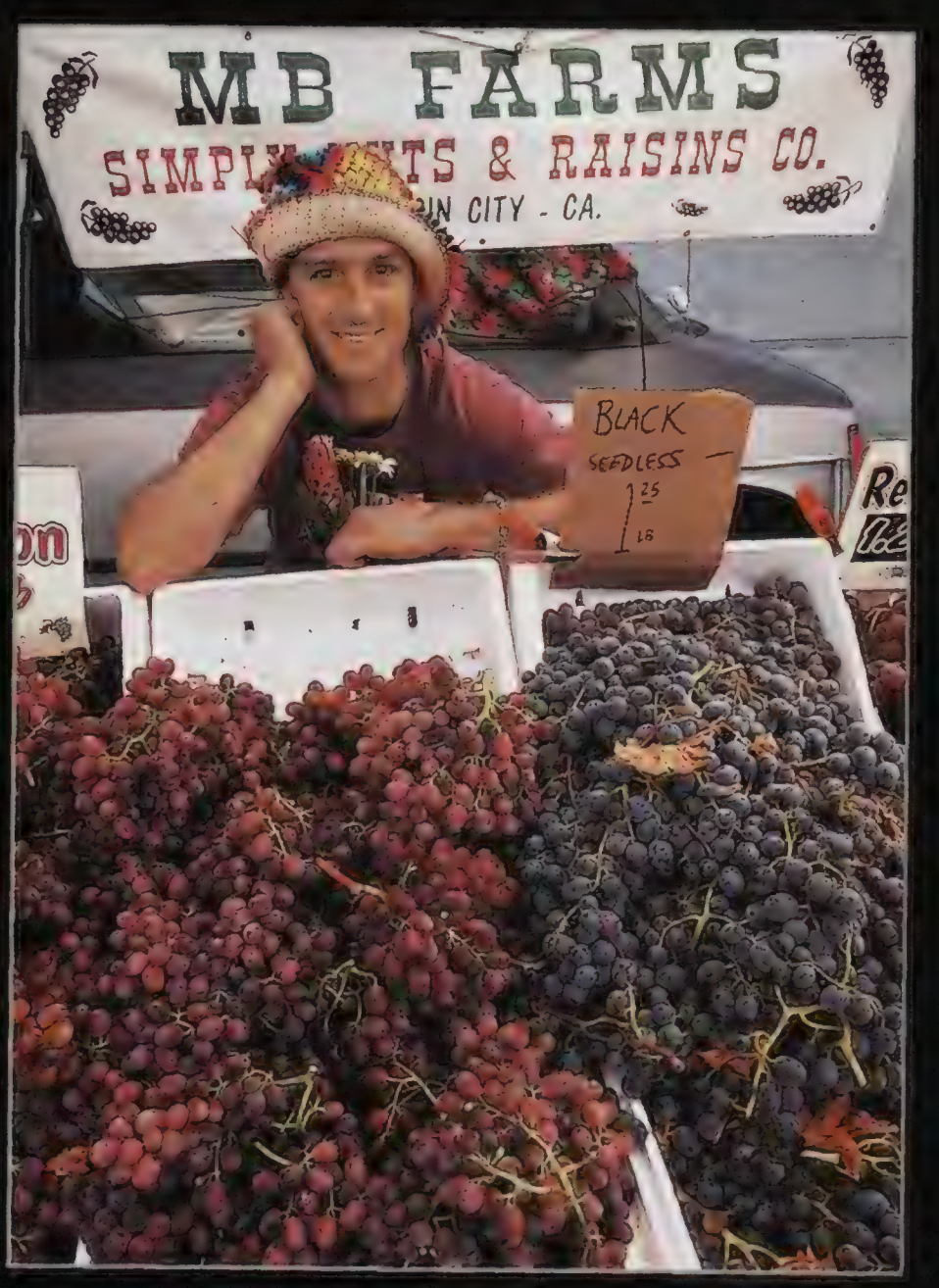
Of course, there's the eating part, too. That's a fact not lost on restaurants, whose chefs often scour farmers' markets for the freshest produce. Maury Rubin, owner and chef at New York's City Bakery, enjoys his restaurant's proximity to Union Square's Greenmarket. "A crucial part of my education about food and the seasons was talking with a handful of farmers at the market," he says. One result is a much-coveted raspberry tart, which appears only during a three-week period in June, when raspberries are in season here. "I don't know many people who want to wait 49 weeks to get a raspberry tart, but my customers do," he notes with a smile.

"I don't know many people who want to wait 49 weeks to get a raspberry tart, but my customers do."

For city dwellers like John T. Grant, such seasonality is the key to the appeal of farmers' markets. "The first signs of spring in New York are at market," he says. "And in the fall, all of a sudden there are pumpkins everywhere. Markets are earthy, organic and real." Lys McLaughlin, executive director of the Council on the Environment of New York City, which sponsors Greenmarkets, agrees. "People crave connection to the earth. Markets provide one very tangible connection." With a smile and typical Manhattan aplomb, she declares, "It's unreal to be sitting in New York in the middle of December and popping those huge strawberries in your mouth. Better to gorge in season."

Despite all the renewed interest, there are remarkably few clear answers to the simple question of what exactly *is* a farmers' market. Though many are publicly operated, like Lancaster's Central Market, private organizations run

Opposite, clockwise from top left: In Hollywood, market mascot Gypsy Boots, left, shows off salad greens; plums get the test at Washington, D.C.'s Open Air Farmers' Market; a cool Californian cruises Santa Monica's Arizona Avenue organic market; Michael Cha tends a stall in Hollywood; Samantha Karle sells jellies and chutneys at New York City's Union Square Greenmarket.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One of 28 Greenmarkets serving New York City, the Union Square site brings fresh flowers and produce to a grateful neighborhood.

others. And what is referred to today as a "producer-only" market used to be the main kind: vendors selling only their own products. Over time, markets develop their own rules and dynamics. Departing from producer-only markets, some allow farmers and other vendors to supplement their own products with produce or goods from neighboring farmers or wholesalers. Other farmers' markets, with a broad range of prepared foods and crafts in addition to fresh produce, may also be termed public markets. Yet others, like New Orleans' French Market, have roots as farmers' markets but today sell little produce. There, atmosphere, rather than vegetables, is the attraction.

Still, even for some distinctly producer-only markets, atmosphere is a huge selling point. At certified farmers' markets near Los Angeles, vegetables regularly meet up with stars and creatively attired shoppers in a dizzying array of live music, books, tamales and crepes, tie-dyed clothing, homemade pet biscuits and—this being California—sunshine and produce galore. "Don't go home without your mustard greens and dandelions!" cries a hawker at the Hollywood farmers' market, against a backdrop of live Peruvian pipe music. Encircled by the Hollywood Walk of Fame—those red stars inscribed with stars' names—and tattoo and tanning shops, the market is prospering beyond many peoples' imaginations. Like New York's Union Square, which before Greenmarket had been home to a thriving drug trade, the neighborhood and city have benefited enormously from the market. "It brings together people from the entertainment industry, well-known people, and the poor. That's been its most wholesome aspect," says Pompea Smith, manager of the Hollywood market. A longtime California resident, she grew up with markets in her native Italy. "This brings me to my roots. I never thought I'd see a market like this here."

And so it goes. Amid crowds of young and old speaking Spanish, Russian, English and Italian—and probably many other languages as well—the cornucopia served up by Southern California's diverse population and Mediterranean climate is nearly overwhelming. At Santa Monica's Pico Market, organic strawberries sit in scarlet mounds next to corn, artichokes, avocados and lettuce greens. Women maneuver strollers filled with mesh bags of oranges past displays of figs too ripe and plump, it seems, to last another minute. In one corner, Philip Xiong sells vegetables familiar to him from his native Laos. Seeing for the first time the tiny speckled globe eggplant from Thailand or the green strands of Chinese long beans, customers often have questions. One holds up a young loofa sponge, its short green torpedo shape punctuated by hard, raised ridges. "Do you use this as a sponge?" she asks doubtfully. Only when it's dried, Xiong replies with a patient smile. She stills looks doubtful. "It is good in chicken soup," Xiong assures her. "Very sweet."

No matter what the market or where it is, though, there is always one commonality: produce doesn't walk. "We're basically a farm for loading trucks," quips Chip Planck. At Wheatland Vegetable Farms, loading for four Saturday markets (including Washington's Open Air Farmers' Market) means all hands to by dusk Friday. For small farms like Wheatland, daylight is quality field time.

But before any tomato or beet hits the bed of one of Wheatland's seven pickups, inventory must be taken. Classified by variety, date picked and size, the week's harvest is counted in the coin of Wheatland's realm, ponies. (Unrelated to small equines of the same name, these ponies are bright green plastic baskets, roughly half a bushel in size.) Then come the sales figures. If one market sold, say, ten ponies of squash last week, and the harvest will increase, then that market could probably sell more this week. But lower the price slightly and even more ponies might sell. Factor in 16 markets every week and more than

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Under elevated subway tracks, Washington, D.C.'s Open Air Farmers' Market enlivens a parking lot near RFK stadium.

50 varieties of vegetables and fruits whose amounts change according to climate and season and hands available, and even an economist might blanch.

Fortunately, Rachel Rudy, a two-year veteran of Wheatland's inventory, has a formula. She pencils the results on a chart in the farmhouse basement, where the week's harvest awaits. The subterranean stone keeps the vegetables, and Rudy, cool. "Everyone has 175 percent of the squash they had last week," she calmly notes on the chart. "Do not despair—our squash is delicious."

At Wheatland, loading may begin quietly enough, with one pickup close by the basement door, but soon a small fleet is packed in, with tanned arms maneuvering plywood sheets over top of already loaded ponies, building up a second, then a third layer in each truck. Standard market accouterments—price signs, scales, tarps, poles—are duly loaded in as well.

Both Susan and Chip Planck are philosophical about their role in markets. "We're not really farmers at all," says Chip, referring to his previous career as a professor of political science and Susan's, as housewife and caretaker of their three children. But even eschewing their lot as farmers, they still are teachers. As Chip gives an impromptu lecture to workers on how to troubleshoot a faulty truck starter, Susan delivers a 15-minute tutorial on the proper way to pick a tomato that is ready for market (hint: don't squeeze). Farmers' markets have been crucial to the Plancks' survival. Remembering their first bountiful crop, which they tried to sell, in vain, on a street corner in a nearby town, Susan laughs. "We were completely bold. But we had no place to sell our produce." Chip nods his head. "It was the classic farm situation. We knew how to grow it, but we didn't know how to sell it." Having helped start four farmers' markets around Washington, they are confident about the future. "The minute you meet one enthusiastic customer," says Chip, "you know it's going to work."

Now, the market day is winding down. In Washington, though it is after 2 P.M., Susan will not take her first break for another hour. It is a typically long Saturday; when Susan and Cate finish here, around 4 o'clock, they will load the truck with the remaining produce and head back to pick for the rest of the daylight hours.

Along the market space now, vendors sweep discarded vegetables and refuse into neat piles. The clang of metal poles sings out against the voices of eager farmers hawking discounted bags of corn, squash and potatoes. All across the country, the same scene is replayed, with farmers like Francis Roland ringing brass bells to signal the end of the market day—until next time.

Here, there is only a woman holding a child. She wants squash, she says. Pulling some out from a pony waiting to be loaded, Susan sells her a large bag for a dollar—with some Middle Eastern thrown in for good luck. Slowly moving off with her sweet burdens, the woman thanks Susan and Cate. "You all have a blessed day."

Valerie Jablow is an assistant editor at the magazine; husband Bill Horne is an engineer. Like them, photographer Bob Krist sampled market treats on this, his second SMITHSONIAN *assignment.*

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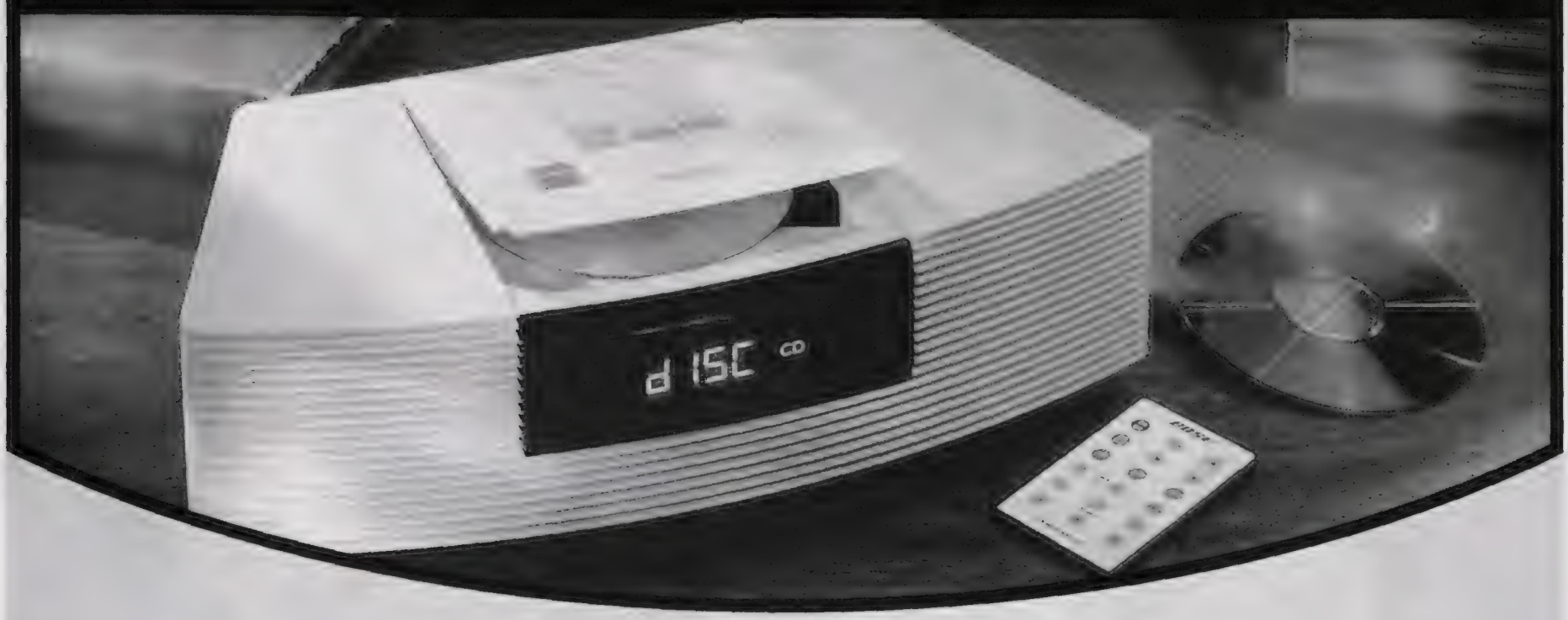

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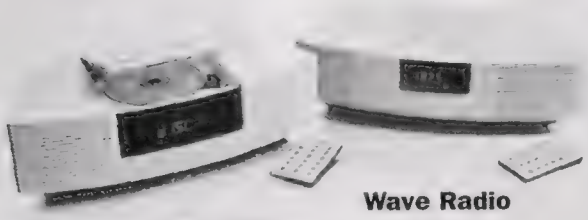

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Discovering the Odds

OVER THE CENTURIES, VISIONARY MATHEMATICIANS LAID THE FOUNDATION FOR HOW WE VIEW LIFE'S GAMBLES

BY JOHN F. ROSS

WHIZZING ALONG A HIGHWAY IN our cars or jetting across the continent, the miles racing by, it's easy to appreciate how these two inventions have changed how we live. So, too, the telephone, the radio and the computer. It is more difficult to measure the impact of the nonmaterial, intellectual revolutions in science over the past several centuries: the heretical insights of Copernicus that shifted the earth from the center of the universe to a mere planet orbiting the sun, Darwin's theory of natural selection, and the subatomic world described by quantum mechanics.

One little-recognized revolution in science and mathematics begun in the 17th century, however, has changed the dynamics of our daily lives even more profoundly. When an eccentric Frenchman by the name of Blaise Pascal noodled around with some simple but startling observations that would eventually become probability theory, it was like letting the proverbial genie out of the bottle. Probability theory and discoveries following it changed the way we regard uncertainty, risk, decision making and a person's ability to influence the course of future events (SMITHSONIAN, November 1995).

By all accounts, Pascal was an odd fellow. He spent much of his short adult life

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torn between his love of mathematics and science and the world of the ultra-strict Jansenists, a fundamentalist Catholic sect. Perhaps because of this dichotomy, he would work out an ingenious response to one of humanity's great conundrums: the question of the existence of God. By looking at the question obliquely, Pascal came up with a useful nonanswer, known as Pascal's Wager, that would usher in what is now called probability theory. He arrived at his solution via mathematics.

Boyhood illnesses had kept Pascal from school in Paris, but his genius didn't take long to bloom. He mastered Euclid's *Elements* by the age of 12, and by 14 he was attending weekly meetings of France's renowned mathematicians. At 19, to lighten his tax-collector father's workload, he invented a mechanical calculating machine.

Mathematical principle, not just the bettor's hunch, can be used to figure the odds in a game of chance.

Pascal's insights into probability came about because a man brought him a puzzle. The chevalier de Méré dabbled in mathematics, mostly putting his hunches to work in the gambling parlors of Paris. It was his love of games of chance that prompted him to bring a two-centuries-old brainteaser to Pascal, who in turn conferred with mathematician Pierre de Fermat, he of "last theorem" fame.

The "problem of the points" involves two players who are in the midst of a series of dice games, winner take all. One is winning, but the match is broken off before it's finished. How does one equitably split the prize money? Pascal dismissed the solution calling for an even split of the purse because it did not adequately reward the person who was ahead. Nor would giving all the money to the person ahead adequately acknowledge the possibility that, should the series be completed, the losing player could come from behind and win. Pascal realized that the answer lay in determining each player's odds of winning. Pascal turned to a device already in use: numbers arranged into tables according to the mathematician's purpose. Pascal's arrangement forms a triangle, now named for him. With it one can calculate the odds one has of winning the series at any point during the contest. The beauty of Pascal's achievement lies in its recognition that mathematical principle, not just the bettor's hunch, can be applied to figuring out the odds in a game of chance. Here was the very idea of probability: establishing the numerical odds of a future event with mathematical precision.

The year 1654 proved pivotal for Pascal. Poor health, bouts with depression and a series of disappointments left him increasingly frustrated with secular life. One day, at Neuilly, his team of horses bolted while crossing a bridge. The force and suddenness of the movement broke the traces, and the horses plunged over the edge of the bridge. A breathless Pascal sat immobile on his now horseless carriage, which remained atop the bridge. The frail genius attributed his miraculous escape from death to divine intervention and saw it as a sign that he should take up religion. He sold his possessions and, at 31, moved to the monastery at Port-Royal-des-Champs, near Paris, to take up the Jansenist life.

Before he died eight years later, Pascal went on to publish important religious treatises. But what attracts our attention today are two pieces of paper, each covered front and back with handwriting scribbled in all directions. He took the same principles of probable outcomes he had worked out with Fermat for the dice games and applied them to an entirely different matter. He asked: "God is, or he is not. Which way should we incline?"

Reason, Pascal thought, could never establish definitively whether God exists. For Pascal, believing in God could have two outcomes, depending on whether God exists. If God doesn't exist, nothing will happen to the believer. If God does exist, the believer will be blessed with eternal salvation. The nonbeliever also faces two possible outcomes. If God doesn't exist, he will suffer no consequences. If God does exist, the nonbeliever will face eternal damnation. The nonbeliever faces either no consequences or hell; the believer looks at no consequences or heaven. Faced with heaven or hell, Pascal reasoned, it makes sense to open oneself to faith.

WHILE LATER PHILOSOPHERS HAVE CRITICIZED THE wager for both its premises and its cynicism, Pascal's logic remains solid. It is the basis for decision theory, defined by historian Ian Hacking as the "theory of deciding what to do when it's not certain what will happen." Pascal's Wager is the very essence of modern-day risk analysis and management: evaluate the consequences of individual and group actions, measure them, and in turn make better decisions.

Pascal's insights into probability were published by Dutch physicist and mathematician Christiaan Huygens in a treatise on gambling, *De Ratiociniis in Ludo Aleae* (On Computations in the Game of Dice), in 1657. "You will find here," wrote John Arbuthnot in the preface to his English translation, "a very plain and easie Method of the Calculation of the Hazards of Game. . . . There is nothing required for the comprehending the whole, but common

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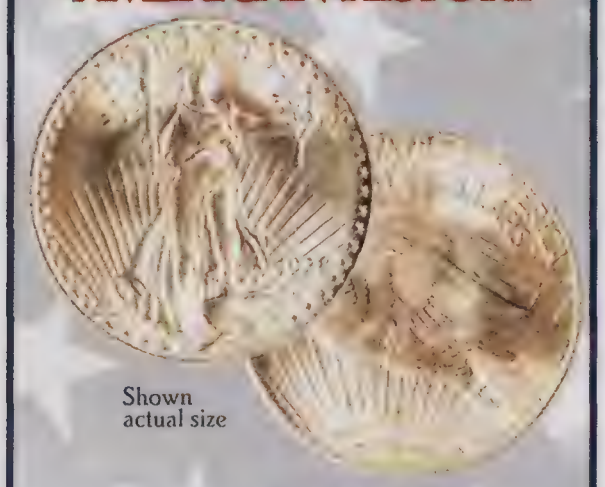

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Sense and practical Arithmetick." Arbuthnot notes, "The Reader may here observe the Force of Numbers, which can be successfully applied, even to those things, which one would imagine are subject to no Rules. There are very few things which we know which are not capable of being reduc'd to a Mathematical Reasoning, and when they cannot, it's a sign our Knowledg of them is very small and confused. . . . "

THE ABILITY TO DESCRIBE THE probability of some future event with numbers—a percentage, for instance, as in "a 40 percent chance of rain"—made it possible to compare the severity or frequency of one risk with another with accuracy. If the expression of risk could be defined in the universal language of numbers, then a person could compare the annual chances in the United States of being killed by shark attack (1 in 2,720,000) versus the odds of being struck by lightning (1 in 5,787,000). In fact, just about any potential risk could be compared with another if enough data was available. One of the first proponents of such comparisons, known as relative risk, was an English haberdasher named John Graunt. He understood the importance of gathering data to divine patterns in the past that might shed light on future events. In the early 17th century, demographic data became the subject of great interest. As early as 1532, the London Privy Council had asked the mayor to supply a tally of plague deaths. In 1603, the disease made a devastating reemergence in Europe. By the end of the 17th century, a "Bill of Mortality" was appearing weekly, listing the causes of death.

The Bills of Mortality that survive tell us something about those whom the grim reaper took away. The bill summing up deaths for the year 1665, for example, includes 65 categories, among them: "Frighted [frightened to death]"—23; "Found dead in streets, fields, and &c."—20; "Childbed"—625; "Collick and Winde"—134; "Stopping of the Stomack"—332; "Grief"—46; "Aged"—1,545. But plague dwarfs all other entries, with 68,596. Graunt perceived greater value in these numbers than merely an indication of the virulence of the plague at any one time. He gathered the death tables between 1604 and 1661 and analyzed them, publishing his results in *Natural and Political Observations made upon the Bills of Mortality*.

Graunt found that most people worry about dying from causes that actually are not very likely to kill them. "Whereas many persons live in great fear and apprehension of some of the more . . . notorious diseases following; I shall only set down how many died of each: that the respective numbers, being compared with the total 229,250 [deaths over 20 years], those persons may the better understand the hazard they are in."

Perhaps most remarkably, Graunt conjectured about the cause of the plague itself. At that time nobody had a clue. The exact cause, a bacterium traveling to humans via fleas carried by rats, would not be discovered until 1894. In Graunt's day, "miasmas," or heavy vapors, and personal contact were at the top of the list of suspects. Graunt noted that the number of plague deaths seesawed abruptly from one week to another. On the basis of this pattern, he surmised that the "contagion of the plagues depends more upon the disposition of the air than upon the effluvia from the bodies of men." He was wrong about the cause, but right that human contact was *not* the cause. In the same way that Pascal didn't need to know whether God existed to think about the consequences of believing or not, Graunt didn't need to know about what caused the plague to make inferences about the nature of the transmission—in this case, the fact that plague was generally not transmitted from person to person like smallpox.

Graunt showed that data, through statistical inference, could point toward causality. He showed that one could crunch data from the past and use it as a torch to peer into the future. Eventually, Graunt's work evolved into the science of epidemiology, in which studies of patterns of sickness reveal links between sickness and certain activities, diets and lifestyles well before science understands the mechanisms of transmission.

Mathematicians after Graunt became fascinated not only with what averages might reveal but with what nonaverage pieces of information could tell them. In other words, if the average American male age of mortality is 73, how normal or abnormal is it if a man dies at 75 or 70? A French Huguenot refugee to England named Abraham de Moivre (1667-1754) became intrigued with the well-known observation that a range of variations exists in almost any set of similar phenomena or populations. Take the height of all Americans, for instance, or the loudness of warblers' songs or the circumference of mature pine trees. Differences naturally occur in each grouping. Some Americans are quite short, others are tall, but most are of near-average height. De Moivre discovered that on a graph the distribution of these variations often follows a particular curve, which looks something like the shape of a bell. Regardless of the grouping—Americans' height, birdsong, tree circumference—the array of variations usually takes the same shape. His discovery would become known as the normal distribution or, more popularly, the bell curve.

If enough samples are taken, the normal distribution describes many naturally occurring populations in nature. De Moivre mathematically described the essence of this curve, so that the units of measurement (height in inches, chirps, or whatever) did not matter. His work hit right at the heart of sampling, the idea of determining patterns in a large population by examining only a few individuals. Using calculations based on de Moivre's, scientists can determine whether a sample number of observations are representative of the larger population by the way they array themselves over the normal distribution. By sampling a small group and statistically examining the variation, scientists can make a good guess about what the entire population looks like. That's why network television consultants can take exit polls and come up with an assessment of how the voting is going long before all the votes are tallied. On the flip side, understanding the extent of natural variations within a group enables an investigator to make predictions about the future. An insurance company, for instance, can look back over several years of data on the number of residential fires, do some statistical work and predict within a range the number of fires that will occur next year. If the actual number of fires turns out to be much higher than expected, then there may be extenuating circumstances to examine: an arsonist or a new brand of faulty space heaters, for instance.

In the late 19th century, an English genius named Francis Galton would give us further insights on the normal distribution, fine-tuning our ability to forecast the future—and risk—with a

De Moivre discovered that on a graph the distribution of these variations often follows a particular curve, which looks something like the shape of a bell.

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greater degree of accuracy than ever before. Galton worked in a variety of fields, but his real contribution came in statistics. His biographer and a noted mathematician in his own right, Karl Pearson, wrote that Galton "modified our philosophy of science and even of life itself." For many, Galton's legacy is darker. He is also the creator of the science of eugenics, the idea of manipulating human populations to bring out the so-called best traits and thus direct the course of human evolution.

Born in 1822, Galton inherited a comfortable living from his father and never had to work, leaving him ample time to satisfy his insatiable curiosity. He would perform pioneering work in fingerprinting and describe anticyclones, the pattern of winds around a barometric high, for the first time. This curiosity took a peculiar form: he liked to measure everything he came across. For example, at a health fair in 1884, he invited visitors into a booth and, with two assistants, measured their weight, standing and sitting height, arm span, breathing capacity, strength of pull and of squeeze, force of blow (three visitors sprained their wrists), reaction time, sight and hearing, color discrimination and judgments of length.

He dovetailed his urge to measure things with an interest in evolution. Galton had become fascinated with the work of his first cousin, Charles Darwin, who had recently published *On the Origin of Species* and introduced the world to the revolutionary idea of natural selection. Galton became curious about the passage of traits from one generation to another. After a discussion with Darwin, Galton set up an experiment. He convinced nine friends, scattered across England, to help him by planting sweet pea seeds in their household gardens. Along with the eight others, Charles Darwin did his share, planting 70 seeds, each carefully presorted by weight and diameter. The participants received exact instructions for planting, upkeep and harvesting.

After the harvest, Galton weighed and measured the seeds of the offspring. When he compared the size and weight of the parents and offspring, he found a curious thing. The seeds of the offspring were less extreme in size than their parents. Instead of creating even larger seeds, the largest parental seeds produced offspring most often smaller than themselves. The smallest parental seeds, conversely, produced seeds that tended to be larger than themselves.

He surmised that the ancestry of an organism—the line of individuals going way back in time—exerts a profound pull on the offspring. He called it reversion to the mean.

Galton pondered the meaning of this information, searching for a pattern. He surmised that the ancestry of an organism—the long line of individuals going way back in time—exerts a profound pull on the offspring. He called this idea the law of reversion to the mean, which later became known as regression to the mean. He wrote: "The law is even-handed; it levies the same heavy successional-tax on the transmission of badness as well as of goodness. If it discourages the extravagant expectations of gifted parents that their children will inherit all their powers, it no less discountenances extravagant fears that they will inherit all their weaknesses and diseases."

Of course, Galton wasn't taking into account what we now know are random genetic mutations and other variations that occur in human pop-

ulations. There are plenty of individual cases that seem to defy Galton's assertions. Genetic anomalies or the phenomenon of assortative mating can account for variations in human populations. The latter simply means that like people are attracted to like people. For instance, I'm 6 feet 3 inches and my wife is also tall (she's 5-foot-9). We bring unusually tall genes to our children, so our children probably will grow to be tall as well. Galton discovered, however, that children of tall people probably won't be as tall as their parents. His findings lead to further understanding of why successive generations of people don't magnify their parents' traits until there is eventually no middle but only extremes—basketball players and jockeys.

Galton's discovery of regression to the mean led him to another groundbreaking finding, a concept that has become a foundation of modern risk analysis. Galton's brainchild was the idea of correlation, that events or conditions can be tied to each other through connections far more subtle and indirect than straight causation.

THE MOST DIRECT RELATIONSHIP between two events is causation. Causation is simple enough: swiftly swing your foot at a soccer ball, and the ball will move. Correlation describes less clearly defined relationships and associations. Take cold weather and snow, for instance. A causal relationship between the two would suggest that cold weather causes snow. Obviously, however, snow doesn't always fall when the weather becomes cold. Snowfall occurs when a front brings moisture into an environment where the conditions are right. Those conditions include its being cold. Or as we say today, cold is necessary but not sufficient. While a causal relationship doesn't exist between cold weather and snow, some kind of relationship does exist, one we call a correlation.

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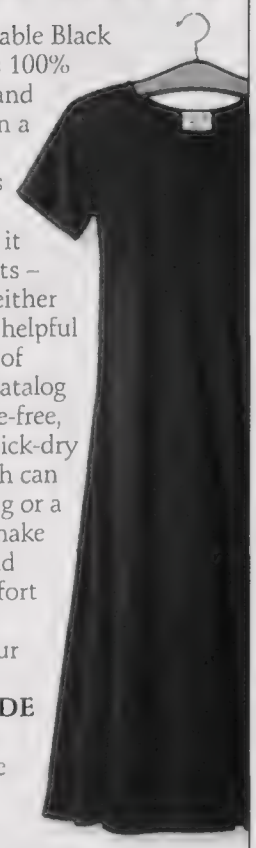

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In many instances, intuition provides a good sense of the difference between causation and correlation. As with the others before him, Galton managed to push beyond intuition. In an 1888 paper, he used the example of the length of a man's arm and leg. Things are said to be correlated, he wrote, "when the variation of the one is accompanied on the average by more or less variation of the other." General observation of the human form reveals that a man's length of arm and leg are correlated because a person with a long arm usually has a long leg as well. But, he asked, how close is that correlation? "If the co-relation be close, then a person with a very long arm would usually have a very long leg; if it be moderately close, then the length of his leg would usually be only long, not very long; and if there were no co-relation at all then the length of his leg would on the average be mediocre." Galton argued that a strong correlation—very long arm usually associated with very long leg—suggests the variations in these two features share a common cause. No correlation at all would suggest no common connection. In between absolute correlation and none at all lies a wide-ranging degree of strong and weak connections. Galton realized that a single number, called the correlation coefficient, could quantify the strength of the correlation between any two variables. It came to him all at once, while he was taking a walk.

"A temporary shower," he wrote, "drove me to seek refuge in a reddish recess in the rock by the side of the pathway. There the idea flashed across me, and I forgot everything for a moment in my great delight." Galton realized he could describe with numbers the amount of variability found in any event or condition. Where the amounts or degrees of variability of any two things are similar, we say there is correlation. The closer the similarity, the closer the

correlation. Galton's insight opened up the way for science to examine the possible connections between all sorts of different things, even if the causal relations were not already apparent.

Today, it's common practice to distinguish between health risks and so-called risk factors. A physician might explain that a diet high in fat increases the risk for heart disease. This is cause and effect: a high-fat diet may lead to arteriosclerosis and blockage of the blood pumping through blood vessels. A high-fat diet is a health risk. Obesity and high blood pressure, however, are risk factors for heart disease. No one yet can prove that these conditions directly cause heart problems. Research shows strong correlations—obese people as well as people with hypertension die more frequently of heart attacks than people who are not overweight and have normal blood pressure. By treating one of these risk factors, an individual can lower his or her risk for heart disease.

THE DISCOVERIES OF PASCAL, DE Moivre, Graunt, Galton and others in probability and statistics blossomed into thousands of different applications. As economist Peter Bernstein has noted, the breakthroughs in probability theory provided structure to look at the world with fresh eyes. In *Against the Gods*, he wrote: "... without that structure, we would have no systematic method for deciding whether or not to take a certain risk or for evaluating the risks we face.... We would have no way of estimating the probability that an event will occur—rain, the death of a man at 85, a 20% decline in the stock market, ... a Democratic Congress, the failure of seatbelts or the discovery of an oil well by a wildcatting firm."

Pascal's theory of probability enriched a civilization exploding with new information about the way the world worked. During the Renaissance, revolutions in science, religion and political theory, and the emer-

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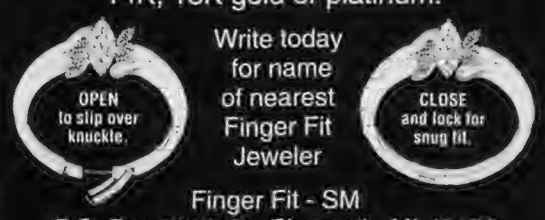

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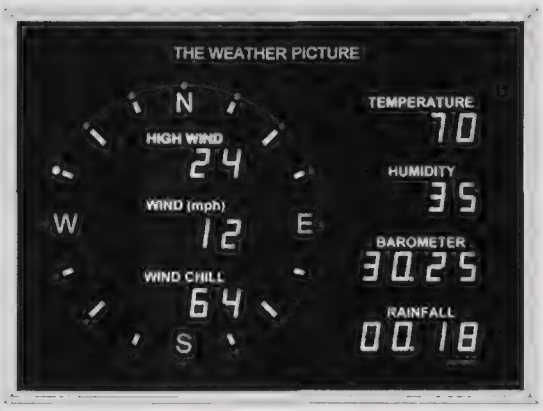

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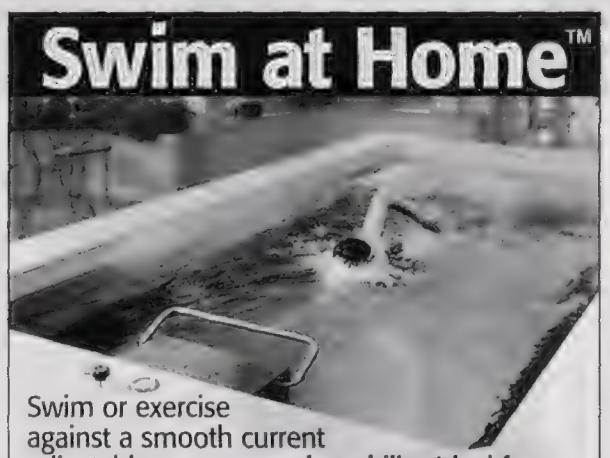

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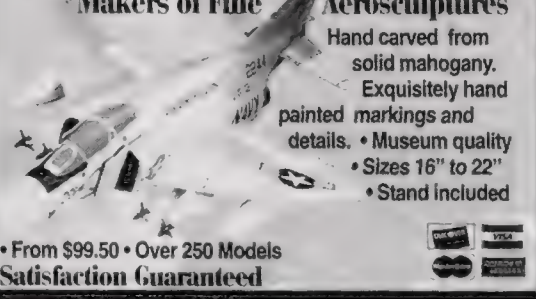

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gence of democratic institutions, freed the individual to think about himself as a free-acting entity, capable of exercising control over his future. Science began to reveal that events and conditions once attributed to the gods or magic were caused in fact by tangible natural forces and substances, or by chance, in a quantifiable way. Probability, it now appeared, was woven into the fabric of the universe. Freed from the yoke of a deterministic worldview, humans could take bold steps to vanquish hazards that had long plagued them. With these new perspectives and a growing arsenal of tools, human beings took great strides toward controlling and manipulating the future in the form of risk-management strategies. By better understanding the likelihood of an event's future occurrence, scientists began to examine the shape of the future itself, the closest thing to looking into a crystal ball that mankind is ever likely to have.

ALL THE INTELLECTUAL TOOLS OF probability theory lead us to one deceptively simple but quite profound revelation: any activity, product, food or event involves risk on some level or another. Every move we make can be calculated and reduced to the risks it poses to us, from the yearly chances of inhaling a toothpick after dinner (1 in 200,000,000) to the chances that in a 65-year lifetime, a person will be killed by an asteroid's hitting the earth (1 in 20,000). Every decision we make holds consequences: cross at the light or not, eat a healthy lunch or not, invest in the stock market or not. Pascal's revolutionary work gave us the possibility of seeing the world in terms of the rich range of consequences—and gave us the tools with which to evaluate them.

This article is adapted from editor John F. Ross' new book, The Polar Bear Strategy: Reflections on Risk in Modern Life, *published in April by Perseus Books.*

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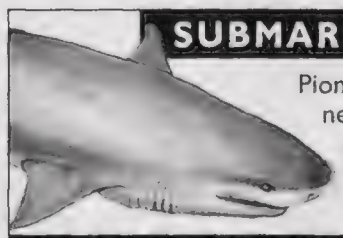

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C

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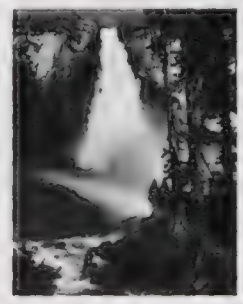

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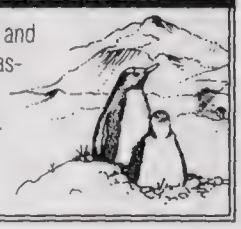

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Leonardo's Nephew
James Fenton
Farrar, Straus and Giroux, $25

Three Worlds of Michelangelo
James H. Beck
Norton, $25.95

What Painting Is
James Elkins
Routledge, $25

WHEN YOU LOOK AT A GREAT PAINTing or sculpture, what more would you like to know about it? Three recent books examine familiar works of art from very different angles. Whether or not they really illuminate these works depends on what you would like to know. James Fenton's essays in *Leonardo's Nephew* are extravaganzas of social history; James Beck's *Three Worlds of Michelangelo* sets genius in the context of family and political biography; and James Elkins' *What Painting Is* digs into the nature of paint, and shows how a painting reveals the artist's mind and hand at work.

With journalistic panache, James Fenton cuts a wide and eclectic swath across the centuries, from Egyptian mummy paintings to the table talk of Degas to Freud's obsession with statuettes, and on to the department store window displays of Robert Rauschenberg and Jasper Johns. Fenton's essays, culled from the *New York Review of Books,* are a particularly literary response to art. He is a poet and treats museums almost as a metaphor, leaping from the artwork to stories of the patrons, dealers, collectors, rivals, mistresses and scandals that surround it—especially the abiding and compelling scandals.

If you want to know that the immortal Florentine sculptor Bernini broke his brother's ribs with a crowbar and sent a servant to disfigure his mistress—after discovering the brother and mistress together—you'll find that grisly story recounted here.

Viewing a Seurat show inspires Fenton to write at length on the question of whether the boys shown bathing in the Seine, in *The Bathers*, were actually bathing in raw sewage. Probably not, he concludes. This "broad approach to the elucidation of art through social history" has its virtues. Fenton gives us wonderful glimpses of painting *en plein air* in the 1700s, complete with details of the paint boxes, palettes and glass paint tubes used at the time, or the curriculum of an art school in Paris in Degas's day. In his essay on Leonardo's nephew Pierino da Vinci, he gives a lucid account of how the artist transformed Dante's poetry into a bronze relief. But Fenton's erudition, and his love of gossip, often seem more a distraction than an appreciation of art.

BECK TRANSFORMS SOURCES INTO STORIES

JAMES BECK'S BIOGRAPHY, THE AUTHOR tells us, "is intended as an interpretation of the personality of Michelangelo." Beck is an academic art historian and gives us Michelangelo's life from the remains of his letters, the accounts of contemporaries, the works of early biographers, the histories of the Medicis in Florence and the popes in Rome, and even the proverbs and scuttlebutt circulating in the streets and courts of the day.

Beck transforms all these sources into stories. As a student in the Medici Gardens, Michelangelo got into a dispute with the sculptor Torrigiani over the merits of their Florentine predecessor, the great painter Masaccio. Here's what Torrigiani later told Benvenuto Cellini of the outcome: "I extended my hand, giving him such a hard punch on the nose that I felt the bone and cartilage of the nose give way, as if it were a sponge cake; and thus, marked by me, he will remain for the rest of his life."

And so he did. Except for the quote, the story Beck tells is as much a piecework of suppositions as an act of scholarship: in the two short paragraphs it takes to describe the incident, the narrative is interspersed with a half-dozen caveats—"must have," "probably," "I imagine," "would have," "likely" and "could have." Such phrases dot the landscape of the book, as required by the art of interpretation, making this very much a Michelangelo-according-to-Beck. The "three worlds" in the book's title refer to Michelangelo's relations with his father, with Lorenzo di Medici and with Pope Julius, the pontiff who commissioned the Sistine Chapel paintings.

At its best, Beck's sense of art history gives us fascinating vignettes, such as the debate in Florence over where to place Michelangelo's giant marble *David*, or an account of the interlude when the artist was painting the Sistine Chapel, learning and inventing a series of new techniques as he worked. But biography, while it may broaden, does not always deepen our appreciation of the art itself. "Throughout his life, Michelangelo almost never wrote about art as such," Beck observes. This may be why Beck's book never transcends its intentions, interpreting Michelangelo's personality without throwing new light on his art.

In a somewhat different vein, James Elkins looks squarely at paint, not through it, finding meanings in hues and brush strokes rather than in histories and biographies beyond the canvas. Elkins is also an academic art historian but was a painter earlier in life, and his words can seem as immediate as oil off the brush, as in this passage: "Painting is scratching, scraping, waving, jabbing, pushing and dragging. . . . Some painting motions are like conversations, where the hands keep turning in the air to make a point. Others are slow careful gestures, like touching someone's eye to remove a fleck of dirt."

Elkins' intimate words are accompanied by color plates showing tiny details of paintings, so close up that we can see the painter's hand at work. He describes his discovery of Monet's technique as he helped a student attempt to copy the master. They discovered two secrets. The paint had to be of a shiny, resilient texture, "thicker than cream, more

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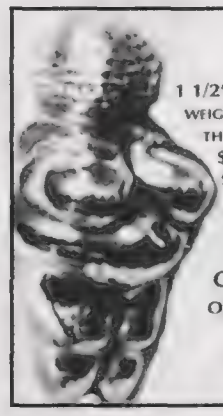
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liquid than vaseline, more rubbery than melted candle wax." Only such paint would withstand Monet's gestures, which turned out to be "violent attacks followed by impulsive twists and turns as the brush moved off. First the brush would scrape wildly, epileptically, against the canvas, jittering across its own trail, breaking it up, laying down thick paint alongside dry paint, and then it would abruptly lift and swivel, turning the jagged edges into little eddies." And what does this tell us of Monet? To Elkins, the gestures reveal an inward-turning concern with the act of painting, more typical of later, action painters. "The paintings are certainly not the instantaneous records of nature that they once seemed," he concludes.

PAINTERS AND ALCHEMISTS HAVE SHARED A PASSION

ELKINS OFFERS SIMILARLY REFRESHING glimpses of Rembrandt, Tintoretto, Jackson Pollock and other painters at work. Besides all this, he offers digressions into the workshops and writings of the alchemists, believing that painters and alchemists have shared a passion for transforming physical substance into transcendent results. Understanding the alchemists, he says, should help readers see more deeply into the art of painting. "To painters," writes Elkins, "unexpected and inexplicable metamorphoses are the stock in trade of everyday work. No one knows what paint does, and when an artist is fooled into thinking paint can be entirely understood, then the studio becomes an [arena of] annoying tedium." It is a nice conceit and produces some interesting analogies, but Elkins gets so engrossed that he sometimes makes painting seem more of a black art than it really is. There is much in this book that makes painting more alive to our eyes. Just take the alchemy with a grain of salt.

Paul Trachtman is based in New Mexico.

Summer at Little Lava: A Season at the Edge of the World

Charles Fergus
North Point Press, $24

THERE'S A SLIVER OF EXAGGERATION, but only a sliver, in Charles Fergus' description of the stretch of western Iceland where he and his family spent a hard summer a few years ago at the "edge of the world." The abandoned farm where he brought his wife and 8-year-old son was the outmost outermost: you reached the 22-by-27-foot concrete-walled house by slogging across a mudflat that flooded with the tide. No road, no electricity, no plumbing, no neighbors you could notice. The weather, to put it charitably, was unfriendly; on a good day the rain let up in the afternoon. The view, also, was somber: gray ocean and dark volcanoes. A lava field adjoined the property.

As it happened, that was pretty much what Fergus was looking for. His 73-year-old mother had been stabbed to death by a man who broke into her Pennsylvania home, and Fergus needed someplace to grieve and get past his grief. At the pocket farm called Little Lava (*litla hraun* in Icelandic, and that's the last Icelandic you'll hear from me), he hoped to find "solitude, birds on the wing, the healing breath of the wind in my face, and the chance to take the days one at a time." Therapeutic isolation, nature as the ultimate healer.

He chose well. His wife, Nancy, had studied the Icelandic language and culture, so they were semi-prepared for the barren, stingy land—and people that often seemed the same way. Icelanders come off here as dour, self-reliant, pragmatic and seriously deficient in joie de vivre (with one exception, whom we don't meet, unfortunately, until the end).

I know I promised not to mention any more Icelandic words, many of which sound like eight or nine boulders cobbled together, but I have to

break my vow to quote Fergus on Icelandic conversations: "A large percentage of every conversation consists of the word ja, meaning yes and standardly pronounced yow," with different inflections to indicate approval, astonishment, dissent or doubt. Fergus got to where he could confidently lob in a yow or two himself. "With all the jas flying this way and that," he reports, "it sounded like a pack of dogs barking."

PEOPLE WERE HELPFUL, BUT OFTEN FOR A PRICE

FERGUS PASSED HIS TIME HIKING, kayaking, bird-watching, climbing and slowly getting to know the people who lived nearby. One farmer had a Labrador retriever named President Clinton, which he pronounced "Clean Tone." People were helpful, yes, but often for a price. The farmer who hauled their equipment across the mudflat in a tractor expected rich-American compensation. Others, however, helped him patch up his breach with the past in a direct and palpable way. They talked about incidents that happened four and five centuries ago—the girl who drowned when the tide caught her, a volcanic eruption—as if they had occurred three months ago.

Fergus is at his best describing the creatures he meets in this craggy, dangerous corner of the world. He discovers that three families of sea eagles nest in the vicinity, and he clambers to one aerie for a face-to-face meeting with a nonplussed eaglet. He describes seals so curious that fishermen catch them by lashing a keg to a long rope and netting them when they can't resist swooping in to investigate. He is bombarded by arctic terns. Dark-coated foxes surefootedly prowl the lava field, where a human misstep can easily result in a broken ankle. "The breeze brought to my ears a sonorous humming, the lowing of thousands of resting eiders," he writes of one outing. "The humming changed pitch slightly, intensified. I looked skyward. High against the clouds was a black shadow. It flapped in level flight. The long, broad wings stopped moving, and the eagle soared. . . . [Then it] flew off, between earth and heaven, like a soul on a long journey."

In time he came to terms with the tragic cause of his own journey in the context of the gritty, unchanging cycle of life in this place where the wind blows hikers off cliffs and the currents turn violent with no warning. His grief slowly melted as he found his own way to transform death into a reliance upon survival.

A few days before Fergus and his family were to leave, he was visited by a roaring, rambunctious hunting-and-fishing guide called Heidar. Heidar, unlike everyone else Fergus met in Iceland, brims with humor and vitality. He wants to drink Scotch, tell stories, eat, laugh and run rampant through the lava field. Fergus finds himself matching him drink for drink and stride for stride. It may be that Iceland is the only place in the world where it's considered a rousing good time to sprint drunkenly through a jagged field of broken lava. But you affirm life where and how you find it.

Reviewer Donald Dale Jackson writes from his home in Connecticut.

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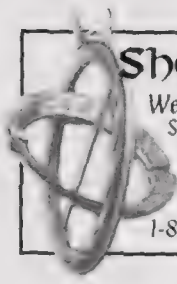

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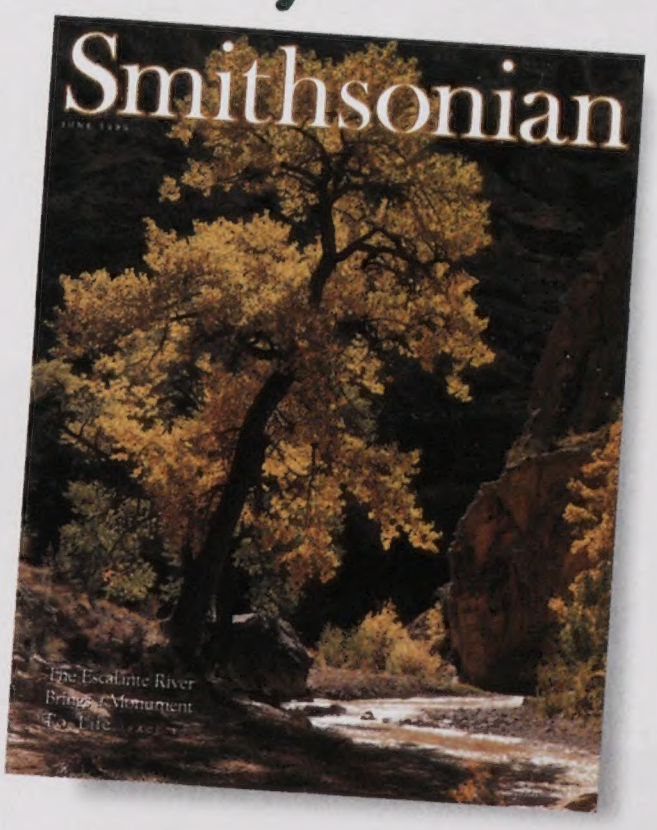

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THE LAST PAGE

A Young Actor Will Do Anything to Get Work

BY ROY SORRELS

WHEN I WALKED INTO MY LOWER East Side apartment that afternoon, the little red light on my answering machine was blinking. The message was from my agent, an enterprising young fellow about my age who shared a tiny office in Midtown with a reflexologist and an aura reader. Our careers, he had assured me, would grow together, along with his office. Let's call him Swifty.

He was a little hard to hear on my antiquated machine, but the message was downright heavenly. Would I like to read for the role of a wily woman in a regional theater production? Swifty asked. He mentioned the time and place. I tried to call him back to celebrate, but the aura reader informed me that he'd gone on vacation for a week, to Newark.

I was an actor in those days, which meant that I drove a taxi, worked as a Kelly Girl temp typist and went to lots of auditions. I even worked as an actor sometimes. I earned my Equity card by signing on to do a dinner-theater gig in a play called *Hot Turkey at Midnight*, in a small town outside Atlanta. As the dinner buffet was hauled away, we actors descended from the ceiling on a Magic Stage. I loved it.

Struggling actors are odd creatures. Computer programmers might ask each other if the job they've just come up with is a *good* one. Actors are willing to settle for any paid job at all, and never mind if it's a "good" one or a "bad" one.

Making the rounds, I learned, was a lot like driving a cab. I always ended up back where I started. But there was one difference. Making the rounds, my feet got sore; in the cab, it was another part of my anatomy.

Now my luck was changing. I had a real audition, not a cattle call but one with an actual appointment and for a specific role, a week off. I was walking on air! If it had been raining, I'd have splashed through puddles like Gene Kelly! It never occurred to me to wonder if I was up to the challenge. If Dustin Hoffman could play a woman, why couldn't I?

My girlfriend at the time helped me with clothes and makeup and accessories, and coached me for hours on how to walk, stand, talk, gesture. I was on cloud nine. I read up on Stanislavski and pored over my battered copy of Michael Chekhov's classic book about acting.

It didn't bother me that this female character didn't have a name. So what? Hadn't I played "Tough Cop" in a high school production? My buddy Earl played "Elderly Passerby" in a play, and my ex-girlfriend Cindy was "Plump Raisin" in a TV commercial. The important thing, after all, was to work.

On the day of the audition, I was just this side of overtrained. I wanted to arrive in a limo or at least a cab, but I'd spent my last $1.69 on eyeliner and had to borrow a couple of subway tokens.

I arrived at the rehearsal studio on time and climbed the stairs, hardly wobbling on my high heels, proud of my determination as an actor, my devotion to my craft. With graceful, scarlet-nailed hands, I gave my picture and résumé to the girl at the table. A wily woman if ever there was one, I strode into the studio—where some actress was intoning the words "So attention must be paid," speaking to Biff and Happy and referring, of course, to that unhappy salesman Willy Loman.

I arrived at the studio, hardly wobbling on my high heels, proud of my determination.

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